GJO–2003–447–TAC

**U.S. Department of Energy**
**Grand Junction Office**

# Site Environmental Report for Calendar Year 2002

## October 2003

GRAND JUNCTION OFFICE

*Work Performed Under DOE Contract No. DE–AC13–02GJ79491 for the U.S. Department of Energy*
*Approved for public release; distribution is unlimited.*

GJO−2003−447−TAC
GJO-LGJO 7.2-1

# U.S. Department of Energy
# Grand Junction Office

# Site Environmental Report
# for Calendar Year 2002

## October 2003

Prepared by
U.S. Department of Energy
Grand Junction Office
Grand Junction, CO 81503

Work Performed Under DOE Contract No. DE−AC13−02GJ79491

# Contents

## Figures (not all figures included in document)



## Tables

# Appendixes

# Acronyms

| | |
|---|---|
| ALARA | as low as reasonably achievable |
| APEN | Air Pollution Emission Notification |
| CAQCC | Colorado Air Quality Control Commission |
| CCR | *Colorado Code of Regulations* |
| CDPHE | Colorado Department of Public Health and Environment |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act |
| CESQG | conditionally exempt small quantity generator |
| CFR | *Code of Federal Regulations* |
| CY | calendar year |
| DOE | U.S. Department of Energy |
| EDE | effective dose equivalent |
| EMS | Environmental Management System |
| EPA | U.S. Environmental Protection Agency |
| FIFRA | Federal Insecticide, Fungicide, and Rodenticide Act |
| g | gram(s) |
| GJO | Grand Junction Office |
| GJORAP | Grand Junction Office Remedial Action Program |
| ha | hectare(s) |
| kg | kilogram(s) |
| lb | pound(s) |
| LLW | low-level waste |
| LTSM | Long-Term Surveillance and Maintenance |
| $m^3$ | cubic meter(s) |
| MEI | maximally exposed individual |
| mg | milligram(s) |
| mg/L | milligrams per liter |
| MLLW | mixed low-level waste |
| mrem/yr | millirem per year |
| µBq/mL | microbequerel(s) per milliliter |
| µCi/mL | microcurie(s) per milliliter |
| NEPA | National Environmental Policy Act |
| NESHAP | National Emission Standards for Hazardous Air Pollutants |
| NiCad | nickel-cadmium |
| Pb | lead |
| PCB | polychlorinated biphenyl |
| pCi/L | picocurie(s) per liter |
| QA | quality assurance |
| QAPP | quality assurance program plan |
| Ra-226 | radium-226 |
| Ra-228 | radium-228 |
| RCRA | Resource Conservation and Recovery Act |
| ROD | Record of Decision |
| RRM | residual radioactive materials |
| RTC | Riverview Technology Corporation |
| SARA | Superfund Amendments and Reauthorization Act |
| TSCA | Toxic Substances Control Act |

| | |
|---|---|
| Th | thorium |
| U | uranium |
| U-234 | uranium-234 |
| U-238 | uranium-238 |
| UMTRA | Uranium Mill Tailings Remedial Action (Project) |
| UMTRCA | Uranium Mill Tailings Radiation Control Act |
| $yd^3$ | cubic yard(s) |
| yr | year |

# Executive Summary

This annual Site Environmental Report presents information pertaining to environmental activities conducted during calendar year (CY) 2002 at the U.S. Department of Energy (DOE) Grand Junction Office (GJO) facility in Grand Junction, Colorado. S.M. Stoller Corporation, the Technical Assistance Contractor for the GJO, prepared this report in accordance with the requirements of DOE Order 231.1, *Environment, Safety, and Health Reporting,* and supplemental guidance from DOE Headquarters. This report applies specifically to the GJO facility.

Primary GJO site activities in 2002 included facility operations and maintenance, waste management, and laboratory analysis of environmental samples from the GJO and other DOE sites. Activities at the GJO are conducted in compliance with applicable Federal, State, and local regulations and requirements and by applicable DOE orders as directed by contract. During 2002, GJO combined the contracts for facility support operations as well as the technical and remediation support activities. The new contract was awarded in May 2002 to S.M. Stoller Corporation, and transition was completed by July 2002.

In 2001, DOE transferred ownership of the site to the Riverview Technology Corporation and remains at the site under a lease agreement with the new owner. Although requirements for management of the site have been reduced, the GJO continues to monitor activities to ensure the protection of workers, public health and safety, and the environment. The types of monitoring include air monitoring for opacity and radionuclide emissions, radiological monitoring, and surface water and ground water monitoring. The GJO also conducts waste minimization and pollution prevention activities and manages wastes in compliance with all applicable laws.

## Highlights for Calendar Year 2002

### *Radiological Monitoring*

- Due to the extremely low quantities and radioactivity levels of materials processed at the GJO during CY 2002, the National Emission Standards for Hazardous Air Pollutants (NESHAP) Subpart H Report was prepared according to the guidelines in Appendix E of Title 40 *Code of Federal Regulations* (CFR) Part 61. Appendix E was authorized for use in a Memorandum of Understanding signed by the U.S. Environmental Protection Agency and DOE in September 1994. This reporting procedure is commensurate with, and appropriate for determining compliance with the NESHAP Subpart H standard, given the small quantities of materials processed at this site. DOE's review concluded that none of the quantities of materials processed or used at the GJO during 2002 exceeded any of the possession quantities listed in Appendix E. Air emissions associated with the GJO activities could not cause a dose greater than the Subpart H standard (10 millirem per year). Consequently, site operations and activities during CY 2002 were in compliance with NESHAP Subpart H; DOE Order 231.1, *Environment, Safety, and Health Reporting*; and DOE Order 5400.5, *Radiation Protection of the Public and the Environment*. This finding is consistent with modeling results performed in previous years. No accidental releases of radioactivity occurred at the GJO in 2002.

- Radionuclide concentrations in samples collected from the Gunnison River in 2002 were below applicable standards in the Colorado Water Quality Control Commission's Regulations 31 and 35 (surface water quality standards).

- Concentrations of total uranium in all samples from the site surface water locations (i.e. the North Pond, South Pond, and the wetland locations) exceeded the uranium standard established for the corresponding segment of the Gunnison River in 2002. The maximum total uranium concentration (1,620 picocuries per liter (pCi/L) [2.37 milligrams per liter (mg/L)]) was detected in the January 2002 sample from wetland location WW-2. The North Pond, South Pond, and wetland location samples were also analyzed for gross alpha, gross beta, radium-226, and radium-228 activity. Gross alpha and gross beta activities in these samples were elevated, which correlate to the elevated uranium concentrations; no surface water quality standards currently exist for these constituents for comparison. The State surface water standard for radium 226+228 (5 pCi/L) was not exceeded in the samples collected from the North Pond, South Pond, and wetland locations.

***Ground Water Monitoring***

- During 2002, concentrations of uranium, molybdenum, selenium, and total dissolved solids in samples from the alluvial aquifer exceeded applicable ground water quality standards. The original ground water modeling of the alluvial aquifer predicted that concentrations of ground water contaminants will be below applicable standards within 50 to 80 years after removal of the contaminant source (uranium mill tailings).

***Nonradiological Monitoring***

- Visible emissions from stationary sources in 2002 never exceeded the permit-specified limit of 20 percent opacity.

- No air permit limits associated with operation of the GJO Analytical Laboratory were exceeded in 2002.

- Manganese and selenium were the only constituents reported in samples collected from the Gunnison River in 2002 to have exceeded a surface water standard. The manganese concentration at the Lower Gunnison location was reported at 0.100 mg/L, exceeding the standard of 0.05 mg/L. This also is the fourth time since 1993, when most of the remediation was completed, that manganese was reported to have exceeded the standard at this location. Selenium concentrations reported at the lower and upper middle Gunnison River sampling locations (0.0088 mg/L and 0.008 mg/L) narrowly exceeded (or equaled) the standard of 0.008 mg/L.

- The North Pond, South Pond, and wetland locations contain elevated quantities of some chemical constituents typically associated with uranium mill tailings (e.g., manganese, molybdenum, and sulfate). In 2002, Gunnison River standards were exceeded for chloride, manganese, pH, and sulfate in samples collected at one or more of these locations.

- During 2002, no extremely hazardous substances or hazardous chemicals were stored at the GJO facility in amounts exceeding the threshold planning quantities established in Sections 311 and 312 of the Superfund Amendments and Reauthorization Act (SARA) Title III. No toxic chemicals were used at the GJO in excess of applicable threshold quantities established in Section 313 of SARA Title III, and no reportable releases of hazardous substances (as defined by Section 304 of SARA Title III) occurred at the GJO facility.

***Waste Management***

- In 2002, the GJO operated as a conditionally exempt small quantity generator (CESQG) (as defined by the Resource Conservation and Recovery Act [RCRA]) by generating less than 100 kilograms (kg) (220 pounds [lb]) per month and storing less than 1,000 kg (2,200 lb) of hazardous waste on site.

- In February 2002, the GJO shipped various RCRA-regulated wastes from the Analytical Laboratory for treatment and disposal to an off-site facility. These wastes totaled 206 kg (453 lb).

- The GJO generated 45 kg (99 lb) of polychlorinated biphenyl (PCB) light ballast waste during the second half of 2001 and disposed of these wastes in February 2002. The GJO received approval from EPA with notification to the Colorado Department of Public Health and Environment (CDPHE) and Mesa County to dispose of residual radioactive material (RRM) contaminated PCB waste at the Grand Junction Disposal Cell. These PCB wastes were generated as a result of fluorescent light ballasts that were removed during cleanup activities associated with the Grand Junction Office Remedial Action Project (GJPORAP). A total of 15 kg (33 lb) of this waste was shipped in May 2002.

- The GJO generated approximately 71 kg (155 lb) of low-level waste (LLW) and 5,248 kg (11,546 lb) of RRM in CY 2002. The GJO transported and disposed of the RRM waste at the Grand Junction Disposal Cell in June 2002. The GJO did not conduct a shipment of LLW during CY 2002.

- Uranium mill tailings remediation continued under the State-operated Grand Junction Office Remedial Action Program (GJORAP) from 1989 through 2001. Under GJORAP, RRM-contaminated soil, building debris (including asbestos), and other RRM-contaminated wastes designated under the Uranium Mill Tailings Radiation Control Act of 1978 (Public Law 95-604), were managed at the GJO and were disposed of at the Grand Junction Disposal Cell. Residual contamination remains under the Analytical Laboratory (Building 20) and the Computer Control Center (Building 12). This contamination was included in a *Request for Deferred Remediation* (DOE 2002a), approved by the State of Colorado in 2001.

***Waste Minimization***

- Normal operations such as replacing batteries in electric vehicles and radios generate spent batteries at the GJO. The site routinely recharges nickel-cadmium (NiCad) batteries and reconditions them to increase the number of possible recharges. NiCad batteries are

sent to a recycling facility when the batteries can no longer be recharged. Lead-acid batteries from vehicles are sent to a local recycler.

- The backup power supply for the GJO's main computer systems uses deep-cycle rechargeable batteries. A vendor exchanges and reuses these batteries according to a contract schedule.

- GJO donated 272 computers and related items to School District 51 in 2002. Also, the GJO was able to find a federal agency that needed 2.5 cases of unused calcium carbide, a hazardous chemical, thus achieving a source reduction of 16 kg (35 lb). The containers were delivered to the agency in June 2002.

- The GJO generates used oil from equipment maintenance. The oil is recycled at an appropriate processing, re-refining, or fuel burning facility on a regular basis. The GJO generated 75.7 liters (which equates to approximately 61.3 kg or 135 lb) of used oil in 2002; this oil was recycled through a local company in January 2003.

- The GJO regularly recycles office paper, cardboard, glass, plastics, aluminum, magazines, and newspaper through a local recycling service. In 2002, the site recycled approximately 28,000 kg (61,600 lb) of these materials.

- The GJO Analytical Laboratory generated 9.6 kg (21 lb) of liquid scintillation cocktail waste during February 2002. This waste was stabilized and solidified using Portland cement in May 2002. The treatment rendered the waste nonregulated and it was subsequently disposed of at the county landfill.

## Environmental Management System

During 2002, GJO operated under the concepts and best management practices that will become the foundation of an Environmental Management System (EMS) as required by Executive Order 13148, "*Greening of the Government Through Leadership in Environmental Management.*" The overall objective of a sitewide EMS is to establish a set of environmental policies and objectives that support environmental protection and prevent pollution, to assess the effectiveness of the system, and to communicate conformance with the objectives to others. The GJO formal EMS will be developed and implemented in fiscal year 2004.

Federal, State, and local laws and regulations, and numerous DOE directives determine the regulatory framework for GJO operations. GJO continues to ensure that all site operations and activities maintain compliance and seeks areas for improving and enhancing the approach to environmental management.

## Site Transfer

In 2000, GJO filed a petition with the Governor of Colorado requesting permission to defer remediation on several areas of the site until a later date. The process is regulated under the Comprehensive Environmental Response, Compensation, and Liability Act, Section 120(h)(3). The Governor approved the request on August 15, 2001, clearing the way for final negotiation

and transfer of the site to non-DOE ownership in September 2001, with DOE–GJO remaining as a tenant on the site.

# 1.0 Introduction

The U.S. Department of Energy (DOE) Grand Junction Office (GJO) is a leased facility located in Mesa County, Colorado, immediately south and west of the Grand Junction city limits at 2597 B 3/4 Road (Figure 1−1). The GJO is 1 kilometer (0.6 mile) from heavily populated areas of Grand Junction. The population of Grand Junction and surrounding areas is approximately 116,255. The entire facility encompasses 22.8 hectares (ha) (56.4 acres) in Government Land Office Lots 1, 6, and 7 in Sections 26 and 27, Township 1 South, Range 1 West, Ute Meridian, Mesa County, Colorado, at an elevation of approximately 1,390 meters (4,560 feet) above sea level (U.S. Geological Survey 1962).

The GJO lies adjacent to the Gunnison River and is separated from the river by an earthen flood-control dike. The facility occupies an elongated, north-south-trending tract bounded on the west by the river and on the north, south, and east by agricultural, open-range, and railroad lands. Moderate, semiarid climatic conditions prevail in the Grand Junction area. Daily temperatures range from an average maximum summer (June, July, and August) temperature of 32 °C (89 °F) to an average minimum winter (December, January, and February) temperature of –7.1 °C (20 °F). Annual precipitation in the Grand Junction area averages approximately 22.1 centimeters (8.69 inches).

The GJO facility lands were acquired by the U.S. War Department in August 1943 to refine uranium for the Manhattan Project. Uranium was milled, analyzed, and stored on the GJO facility from 1943 to 1975. All known environmental contamination is believed to be the result of these past activities. Site characterization and remedial action studies to assess the radiological hazards at the facility began in 1984 (Henwood and Ridolfi 1986) when the facility was accepted into the DOE Surplus Facilities Management Program. Facility oversight was transferred to the Defense Programs Decontamination and Decommissioning Program in 1988. In 1990, oversight of the GJO was transferred to DOE's Office of Environmental Management.

In planning for cleanup of the facility, GJO complied with the National Environmental Policy Act (NEPA) process and, pursuant to direction from DOE Headquarters, used the environmental management protocols of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), even though the site did not qualify for placement on the National Priorities List. A final remedial investigation/feasibility study−environmental assessment that addressed remediation of the facility was completed in 1989 (DOE 1989). Removal of contaminated soils from open-land areas began in 1989 and was completed in June 1994 (Figure 1−2); cleanup of most of the remaining contamination in and beneath on-site buildings was completed in 2001 (see Section 3.0).

Ground water within the alluvial aquifer beneath the site is contaminated with the leached products of on-site uranium mill tailings. Water from the aquifer is not used for any purpose. All domestic surface water sources for the Grand Junction area are located upstream of the GJO facility or are obtained from the Colorado River drainage system. The Gunnison River, which converges with the Colorado River about 0.8 kilometer (0.5 mile) downstream of the facility, is used for seasonal recreational activities such as boating, fishing, and swimming.

In 2000, the GJO filed a petition with the Governor of Colorado requesting permission to defer remediation on several areas of the site until a later date. The process is regulated under

CERCLA, Section 120(h)(3). The Governor approved the request on August 15, 2001, clearing the way for final negotiation and transfer of the site to non-DOE ownership in September 2001. The GJO remains as a tenant on the site.

In February 1999, DOE leased the southern portion of the site to the Grand Junction Economic Partnership Small Business Incubator Project (Incubator). The Incubator houses approximately 20 small businesses. The offices are used primarily for service-type businesses (e.g., machining equipment, distribution of food stuffs, light manufacturing, etc.). In December 2001, DOE transferred ownership of a tract of land (7.97 acres) on the northwest portion of the property to the U.S. Army Reserve.

The GJO mission is to provide project management, engineering, and scientific support to the Federal Government's environmental restoration programs. Major programs administered from the GJO site include the DOE Long-Term Surveillance and Maintenance (LTSM) Program, the Moab Project, the Monticello Mill Tailings Site Remedial Action Project, the Pinellas Environmental Restoration Project (located at the Young-Rainey STAR Center in Largo, Florida), the Uranium Mill Tailings Remedial Action (UMTRA) Ground Water Project, and the DOE Uranium Lease Management Program. The GJO also provides support to other DOE work initiatives and technical projects (e.g., the Hanford Tank Farm Project and the Permeable Reactive Barrier project).

The GJO site also houses a fully equipped Analytical Laboratory that provides analytical chemistry support to various DOE environmental restoration programs and sites. Upon completion of the contract transition period in July 2002, approximately 170 people (including DOE and contractor staff) were employed at the GJO facility.

The purpose of this report is to provide DOE, State officials, the people of Colorado, and other interested parties with current information on GJO activities and the effects of these activities on the environment. This report is structured as follows:

- **Section 2** defines the laws and regulations that govern operations at the site and includes information about the site's compliance status.
- **Section 3** describes the environmental programs operating at the site.
- **Section 4** summarizes the data acquired under the radiological monitoring program.
- **Section 5** summarizes the data acquired under the nonradiological monitoring program (including waste management and pollution prevention).
- **Section 6** discusses in detail the ground water monitoring program and data.
- **Section 7** provides an overview of the quality assurance measures implemented at the site.
- **Section 8** provides the list of references used in the preparation of this document.

# 2.0 Compliance Summary

This section describes the status of GJO compliance with applicable Federal environmental regulations, describes current issues and actions such as environmental audits, and contains a summary of the permits held by the GJO for management of the GJO site. The GJO's U.S. Environmental Protection Agency (EPA) Identification number is CO6890090065.

## 2.1 Compliance Status

The GJO site operated during calendar year (CY) 2002 without receiving any notices of violation and did not have any occurrences that required reporting to outside agencies.

### 2.1.1 Comprehensive Environmental Response, Compensation, and Liability Act

Although the GJO facility was not placed on the National Priorities List by EPA, GJO elected to use the CERCLA management protocols for environmental cleanup of the facility. The Grand Junction Office Remedial Action Project (GJORAP)[1] was initiated to remove contaminated materials associated with past uranium milling and procurement activities on the site. A remedial investigation/feasibility study-environmental assessment (DOE 1989) was completed in 1989, and a Record of Decision (DOE 1990) was made final and approved by the DOE Idaho Operations Office in April 1990.

GJORAP was completed in September 2001; all available records were appropriately archived in accordance with GJO Records Management procedures. The GJORAP Information Repositories required by CERCLA are in the Mesa County Library in Grand Junction and in the Technical Library at the GJO. The repositories were updated in July 2002.

In 2000, the GJO filed a Request for Deferred Remediation (DOE 2000a) under CERCLA 120(h)(3) to request permission of the Governor of Colorado to defer remediation on portions of the site and to transfer the site prior to completion of remedial action. CERCLA 120(h)(3) applies to the transfer of federally owned properties that are not officially CERCLA sites, but where the use, storage, or release of CERCLA hazardous substances has occurred. Approval of the request by the Governor was obtained on August 15, 2001, and transfer of the property to non-DOE ownership was completed in September 2001.

The areas that remain to be remediated are:

- A contaminated slab and underlying soil from a former building under Building 12 (this will be remediated when the building is demolished at the end of DOE use).
- An area of contaminated soil and construction debris under the southwest corner of Building 20 (this will be remediated when the building is demolished at the end of DOE use).
- Surface and ground water (subject to passive remediation discussed in Sections 4.4.1 and 6.0 of this document).

[1] The project was called the Grand Junction Projects Office Remedial Action Project (GJPORAP) until fiscal year 1997.

The GJO has taken all appropriate measures to ensure protection of human health and the environment and, as required by CERCLA 120(h)(3), has committed to funding actions that may be required to remediate contamination resulting from past DOE activities at the site.

### 2.1.2 Superfund Amendments and Reauthorization Act, Title III, Executive Order 12856

GJO developed a Chemical Tracking System in 1995 to comply with the reporting and notification requirements of the Superfund Amendments and Reauthorization Act of 1986 (SARA), Emergency Planning and Community Right-To-Know Act of 1986 (Sections 311, 312, and 313); and Executive Order 12856, *Federal Compliance with Right-to-Know Laws and Pollution Prevention Requirements*.

During 2002, no extremely hazardous substances or hazardous chemicals were stored at the GJO facility in amounts exceeding the threshold planning quantities established in Sections 311 and 312 of SARA Title III. No toxic chemicals were used at the GJO in excess of applicable threshold quantities established in Section 313 of SARA Title III, and no reportable releases of hazardous substances (as defined by Section 304 of SARA Title III) occurred at the GJO facility; therefore, the applicability of SARA Title III reporting requirements for CY 2002 is as follows:

- Sections 302−303: Planning Notification—not required.
- Section 304: Extremely Hazardous Substance Release Notification—not required.
- Sections 311−312: Material Data Safety Sheets/Chemical Inventory—not required.
- Section 313: Toxic Chemical Release Inventory Reporting—not required.

Although "negative" reporting is not required under the statutes, GJO informed the Colorado Emergency Response Commission, the Mesa County Emergency Planning Committee, and the Grand Junction Fire Department by letter that no chemicals were stored in quantities that exceed the applicable thresholds during 2002.

### 2.1.3 Resource Conservation and Recovery Act

DOE−GJO usually operates under the special requirements (codified at Title 40, Section 261.5, of the *Code of Federal Regulations* [CFR]) for conditionally exempt small-quantity generators (CESQGs) of hazardous waste. GJO maintains its CESQG status by generating no more than 100 kilograms (kg) (220 pounds [lb]) of hazardous waste or 1 kg (2.2 lb) of acutely hazardous waste in a calendar month and storing no more than 1,000 kg (2,200 lb) before shipping off site for treatment and disposal. CESQG wastes are not subject to full regulation under 40 CFR 124, 262 through 266, 268, and 270; however, the generator must comply with certain requirements. CESQGs can accumulate waste on site and remain exempt from full regulation as long as generation and storage requirements are not exceeded. If on-site waste accumulation exceeds 1,000 kg (2,200 lb), all the accumulated wastes become subject to small-quantity generator requirements, including the land disposal restrictions codified at 40 CFR 268.

In 2002, the GJO operated as a CESQG. Despite its status, the GJO maintained all programs necessary to operate as a small or large quantity generator if needed. Such programs generally include increased personnel training, inspections, and facility record keeping.

Hazardous and mixed wastes are generated primarily by the GJO Analytical Chemistry Laboratory and from co-mingled hazardous and residual radioactive material generated during site remediation. The GJO stores hazardous and mixed waste in satellite accumulation areas and in designated hazardous waste storage areas, including commercially manufactured storage modules (Buildings 61A and 61C). Hazardous wastes are shipped off the site to commercial treatment and disposal facilities once or twice each calendar year, or as required by law.

### 2.1.4 National Environmental Policy Act

During 1996, the *Environmental Assessment of Facility Operations at the U.S. Department of Energy Grand Junction Projects Office, Grand Junction, Colorado* (DOE 1996) was completed. This Environmental Assessment described the potential environmental and human health effects associated with operations at the GJO facility. Completion of the Environmental Assessment and issuance of the accompanying Finding of No Significant Impact reduced the number of activity reviews required under NEPA at the site. In January 2000, GJO prepared the *Environmental Assessment for the Transfer of the Department of Energy Grand Junction Office to Non-DOE Ownership* (DOE 2000b) to review the potential impacts, both environmental and economic, of the transfer of the site. Following public comment resolution, a Finding of No Significant Impact was issued in April 2000.

As part of the site NEPA compliance program, the GJO submits information for the DOE-Headquarters NEPA Annual Planning Summary, which lists environmental assessments and environmental impact statements to be prepared during the year. During 2002, all activities and operations at the GJO were conducted in compliance with applicable NEPA requirements.

### 2.1.5 Formerly Utilized Sites Remedial Action Program

The Formerly Utilized Sites Remedial Action Program controls the DOE procedures for release of contaminated sites, and GJORAP met the specific objectives of release surveys in order to release property to the public. The guidelines, detailed in DOE Order 5400.5, *Radiation Protection of the Public and the Environment*, are as follows:

- *Surface radioactivity on buildings and structures*—Release surveys must show that average surface-contamination levels and hot spots are within guidelines and that reasonable efforts have been made to clean up removable radioactivity.

- *Volume of radioactivity in soil and concrete*—Release surveys must show that average radionuclide and hot spot concentrations are within guidelines.

- *Airborne radon decay-product concentrations*—Release surveys must show that radon decay concentrations are within guidelines.

- *External gamma radiation*—Release surveys must show that average levels of gamma radiation inside occupied buildings or habitable structures and average levels of gamma radiation in outside areas do not exceed guidelines.

- *As low as reasonably achievable (ALARA) requirements*—Release surveys must show that DOE's ALARA policy has been implemented and that quantities of radioactivity and residual radioactive materials are as low as reasonably achievable.

DOE Order 5400.5, *Radiation Protection of the Public and the Environment* will be superseded when 10 CFR 834 is promulgated; however, the guidelines will remain essentially the same.

***Release Surveys***

Under GJORAP, radiologically contaminated soil, building debris (including asbestos), and other radiologically contaminated wastes were managed to protect the environment and personnel, and were disposed of at a DOE-owned repository (Section 3.4.3). After contamination in an open land area or building was remediated, release surveys were performed and closeout reports prepared to release the area or building for unrestricted use. By the end of the project in 2001, GJORAP had demolished 16 buildings and remediated or verified for release for unrestricted use the remaining 33 buildings present at the facility.

### 2.1.6 Clean Air Act/National Emission Standards for Hazardous Air Pollutants

In 1991, the Colorado Department of Public Health and Environment (CDPHE) granted GJO an air emission permit for the GJO Analytical Laboratory. The permit established limitations on (1) the annual emissions of particulate matter, volatile organic compounds, and benzene; (2) the annual consumption of acids, volatile organic compounds, and benzene; and (3) the opacity of emissions. As in previous years, no limits were exceeded in 2002.

Due to the extremely low quantities and radioactivity levels of materials processed at the GJO during CY 2002, the National Emission Standards for Hazardous Air Pollutants (NESHAP) Subpart H Report was prepared according to the guidelines in Appendix E of 40 CFR 61. This alternative reporting method was authorized for use in a Memorandum of Understanding signed by EPA and DOE in September 1994. This reporting procedure is commensurate with, and appropriate for determining compliance with, the NESHAP Subpart H standard given the small quantities of materials processed at this site. According to GJO's review, none of the quantities of materials processed or used at the GJO during 2002 exceeded any of the possession quantities listed in Appendix E. As a result, air emissions associated with GJO activities could not cause a dose greater than the Subpart H standard (10 millirem per year [mrem/yr]). Consequently, site operations and activities during CY 2002 were determined to be in compliance with NESHAP Subpart H; DOE Order 231.1, *Environment, Safety, and Health Reporting*; and DOE Order 5400.5, *Radiation Protection of the Public and the Environment*. This finding is consistent with modeling results performed in previous years. No accidental releases of radioactivity occurred at GJO in 2002.

### 2.1.7 Clean Water Act/National Pretreatment Program

Sewer effluent from the facility is routed to the publicly owned treatment works operated by the City of Grand Junction. In 2000, the City re-evaluated the status of the facility and determined that the GJO site no longer met the requirements of an "industrial user" as defined by the regulations. Therefore, the City did not renew the Class II Industrial Pretreatment Permit (No. 023). Because the site remains subject to the discharge limits, the GJO Analytical

Laboratory has implemented several administrative controls and best management practices to ensure compliance with the substantive requirements of the Industrial Pretreatment Program. Pursuant to an exemption to DOE Order 5400.1 (which has subsequently been replaced by DOE Orders 231.1 and 450.1), GJO is no longer required to sample the sewer effluent for radioactive constituents. Therefore, all sampling of the sewer effluent has been discontinued.

The GJO facility has no wastewater or storm-water discharges that are regulated by the National Pollutant Discharge Elimination System and, therefore, is not required to have discharge permits for its current activities and operations.

### 2.1.8 Clean Water Act/Executive Order 11990, *Protection of Wetlands*

Wetland areas are present on the GJO facility along the shores of the South and North Ponds and in depressional areas in the northern portion of the facility. During 2002, no actions were taken at the site that affected the wetland areas.

### 2.1.9 Safe Drinking Water Act

The provisions of the Safe Drinking Water Act are not relevant to the GJO facility because neither ground water nor surface water at or near the site is used for public consumption. All water is provided to the site by the City of Grand Junction, whose drinking water system conforms to the requirements of the Safe Drinking Water Act.

### 2.1.10 Toxic Substances Control Act

The Toxic Substances Control Act (TSCA) was enacted in 1976 to regulate the manufacturing and distribution of certain chemical substances. TSCA provides EPA with authority to require testing of chemical substances, both new and old, entering the environment and to regulate their production, sale, and management as a waste, where necessary.

TSCA specifically addresses the use and management of PCBs and asbestos. The quantity of TSCA-related wastes generated at GJO is historically low and resulted primarily from removal of PCB light ballasts and asbestos wastes such as ceiling insulation, exterior siding (i.e., transite) and floor tile. In 2002, only a small quantity of expired PCB standard was generated by the GJO. Off-site shipments of PCB wastes generated in 2001 also took place in 2002. These shipments are detailed in Section 3.4.2.

### 2.1.11 Federal Insecticide, Fungicide, and Rodenticide Act

The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) governs the use, storage, registration, and disposal of pesticides. FIFRA categorizes pesticides as either “restricted use” or “general use.” EPA may classify a pesticide as restricted use (1) if it is determined that substantial adverse effects to the applicator or environment may occur without additional regulatory restrictions or (2) if unreasonable harm to humans or the environment may occur, even if the pesticide is used as directed by the label instructions. FIFRA regulations require that restricted-use pesticides be used or applied only by a certified private or commercial applicator or under the direct supervision of a certified applicator. There were no certified applications of pesticides at the site in 2002.

### 2.1.12 Endangered Species Act

Section 7 of the Endangered Species Act requires DOE to ensure that any actions authorized, funded, or performed at the facility do not "jeopardize the continued existence of threatened or endangered species and do not destroy or adversely modify critical habitat required for the continued existence of that species." The Gunnison River adjacent to the facility provides habitat to four endangered fish: the Colorado pike minnow, humpback chub, bonytail chub, and razorback sucker. The GJO did not withdraw or discharge water from the Gunnison River in 2002 and has no plans for withdrawing or discharging water in the future.

### 2.1.13 National Historic Preservation Act

Before the GJO facility was transferred to the Riverview Technology Corporation (RTC) in 2001, DOE conducted a survey of on-site buildings to determine if any of them would qualify for listing in the National Register of Historic Places. Subsequent to the 1999 building survey (Schweigert 1999), the GJO complex was recommended for listing as a historic district on the basis of its significance in uranium exploration, milling, and processing from 1943 to 1970. Because divestiture of the property to RTC was considered an adverse effect on the historic district, DOE was required by the Colorado State Historical Preservation Office to preserve the historical values of the property by completing a Historic American Engineering Record of the site and having a sign with historic information erected on the site. This sign will be completed in 2003. The RTC is not required to comply with the National Historic Preservation Act unless their action is federally funded or licensed. During 2002, no actions were funded, licensed, or undertaken by DOE that affected historic buildings on the GJO facility.

### 2.1.14 Executive Order 11988, *Floodplain Management*

The GJO facility, located behind the dike adjacent to the Gunnison River, is not on a floodplain (Mesa County Flood Maps 2003). Therefore, this executive order is not applicable.

## 2.2 Current Issues and Actions

There were no major ongoing environmental issues at the GJO and there were no nonroutine or unplanned releases to the environment during CY 2002. GJO uses external environmental audits, internal environmental audits, and management compliance assessments to evaluate environmental compliance and to implement corrective actions.

### 2.2.1 Assessments

During 2002, one customer assessment and three certification agency assessments were performed on the GJO Analytical Laboratory. The certification assessments resulted in certification renewal in all cases.

Three internal independent assessments were conducted during 2002. Topics for the internal assessments included ground water sampling, security, and ALARA compliance.

Contractor management completed one management assessment of the on-site satellite accumulation areas. Also during 2002, four surveillances were conducted that verified compliance with internal procedures.

Representatives from CDPHE visited the GJO for their annual inspection. The State is required to inspect the site's permitted waste storage facility each year as part of their Resource Conservation and Recovery Act (RCRA) compliance program. For the third year, the inspectors issued a Notice of Inspection confirming that the inspectors found no issues or areas of concern.

## 2.3 Summary of Facility Permits

Table 2−1 shows the types of permits that were active at the GJO site during 2002

*Table 2–1. Types of GJO Permits Active in 2002*

| Type of Permit | Issuing Agency | No. of Permits |
|---|---|---|
| Air Emission Permit | State of Colorado | 1 |
| Well Permit | State of Colorado | 6[a] |

[a]There are 8 monitor wells located on the GJO Facility; however, only 6 were officially permitted as of CY 2002. Well permits for the other 2 wells were issued by State of Colorado in 2003.

End of current text

# 3.0 Environmental Program Information

Environmental programs at the GJO facility include air monitoring, water monitoring, radiological monitoring, environmental remediation, waste management, and pollution prevention. This section provides descriptions of all program elements except the ground water program, which is presented in Section 6.0, "Ground Water Monitoring and Protection Program." Air and water monitoring results and data, excluding ground water, are presented in Section 4.0, "Environmental Radiological Program Information," and Section 5.0, "Environmental Nonradiological Program Information." This section also presents brief discussions of data associated with environmental remediation, waste management, and pollution prevention.

In addition to the environmental programs, GJO has a comprehensive Integrated Safety Management System and Radiological Control Program to minimize workplace hazards and to ensure protection of employees and the public. These programs are described in the *GJO Health and Safety Manual* (GJO 2), the *GJO Site Radiological Control Manual* (GJO 3), and the *Grand Junction Office Integrated Safety Management System Description* (GJO 10).

## 3.1 Air Monitoring

### 3.1.1 Air Emissions Monitoring and Estimation for Radiological Constituents

Radiological air-emissions monitoring and evaluation was conducted on the GJO facility to assess the potential for radiation dose to members of the public that could result from site operations and to demonstrate compliance with the dose standards established by NESHAP, 40 CFR 61 Subpart H; and DOE Order 5400.5.

Historically, radiological air emissions at the GJO facility have consisted primarily of both point- and non-point sources of radiological air emissions. The point-sources for potential radiological air emissions included the Sample Plant (Building 46) and the GJO Analytical Laboratory (Figure 3−1). Non-point sources of potential radiological air emissions were associated with residual radiological contamination (i.e., contaminated soils and buildings) that remained at the facility. During 2001, these residual radioactive contaminants were remediated and removed from the GJO facility. Historical radiological air monitoring results indicate that these non-point sources were the major contributor to the total effective dose equivalent (EDE) that was previously calculated for the facility. Because the non-point sources of contamination were removed in 2001, monitoring in these same areas was not conducted in 2002. Since all on-site remediation was completed in 2001, the only remaining potential sources of radiological air emissions were those associated with the point sources (i.e., the GJO Analytical Laboratory and the exhaust stacks from the Sample Plant).

#### *Point Source Particulates*

One point source (the Sample Plant) and one grouped source (the GJO Analytical Laboratory) contributed to radionuclide emissions from the GJO facility during 2002. The four GJO Analytical Laboratory point sources were combined into a grouped source because they have similar function, controls, and location. EPA granted an indefinite waiver of sampling requirements for the GJO Analytical Laboratory and required that the Sample Plant emissions be subject to periodic confirmatory measurements (November 2, 1990, and December 20, 1991, correspondence between EPA and GJO).

The occupant of Building 7 has been designated as the maximally exposed individual (MEI) and represents the member of the public receiving the largest dose from all sources of radionuclide emissions combined. The GJO point and group sources, effluent controls, estimation of control efficiency, and distance from the release points to the MEI are presented in Table 3–1.

*Table 3–1. GJO Point Source Information*

| Point Source | Type of Control | Efficiency (%) | Distance to Nearest Receptor (MEI) |
|---|---|---|---|
| Sample Plant | High-efficiency filtration system | 95 | 122 meters (402 feet) |
| **Grouped Source** | **Type of Control** | **Efficiency (%)** | **Distance to Nearest Receptor (MEI)** |
| GJO Analytical Laboratory (4 sources total) | Wet scrubbers | 50–75 | 152 meters (502 feet) |

Due to the extremely low quantities and radioactivity levels of materials processed at the GJO during CY 2002, the radiological air emissions for CY 2002 were estimated according to guidelines in 40 CFR 61, Appendix E. Use of these guidelines was authorized in a Memorandum of Understanding signed by EPA and DOE in September 1994. This reporting procedure is commensurate with, and appropriate for determining compliance with, the NESHAP Subpart H standard given the small quantities of materials processed at this site. According to GJO's review, none of the quantities of materials processed or used at the GJO during 2002 exceeded any of the possession quantities listed in Appendix E. As a result, air emissions associated with GJO activities could not cause a dose greater than the Subpart H standard (10 mrem/yr). Consequently, site operations and activities during CY 2002 were in compliance with NESHAP Subpart H; DOE Order 231.1, *Environment, Safety, and Health Reporting*; and DOE Order 5400.5, *Radiation Protection of the Public and the Environment*. This finding is consistent with modeling results performed in previous years. No accidental releases of radioactivity occurred at GJO in 2002.

### 3.1.2 Air Emissions Monitoring and Estimation for Nonradiological Constituents

Air emissions monitoring and estimation for nonradiological constituents is conducted on the GJO facility to demonstrate compliance with specific permit and Air Pollution Emission Notification (APEN) exemption requirements. Air emission sources of nonradiological constituents at the GJO facility include the Analytical Laboratory and the Sample Plant. These sources are regulated by the Colorado Air Quality Control Commission (CAQCC) Regulation No. 3.

The GJO Analytical Laboratory is subject to the requirements of Emission Permit No. 90ME402–1 issued by the Air Pollution Control Division of the CDPHE. The permit specifies visible emission (opacity) limits; sets limits on particulate matter (as acids), volatile organic compounds, and benzene emissions; and sets maximum consumption rates on acids, volatile organics, and benzene. The Sample Plant emission source was granted APEN and permit exemptions (No. 90 ME402−2) by the Air Pollution Control Division.

***Opacity***

Air Emission Permit No. 90ME402–1, the APEN/permit exemptions granted to the Sample Plant, and Colorado Air Quality Control Commission Regulation No. 1 require that visible emissions from sources at the site not exceed 20 percent opacity. No emissions requiring opacity observations occurred during 2002.

***Permitted Releases***

In addition to the opacity requirement, Air Emission Permit No. 90ME402–1 for the GJO Analytical Laboratory establishes limits on the annual emissions of particulate matter, volatile organic compounds, and benzene and the annual consumption of acids, volatile organic compounds, and benzene. For CY 2002, all emissions of regulated pollutants were below the limits specified in the emission permit. Consumption rates are monitored annually to demonstrate compliance with these permit conditions. The APEN exemption granted for the Sample Plant establishes limits on the quantity of soil processed annually. Soil processing is monitored to demonstrate compliance with this APEN exemption requirement. Section 5.0 provides a comparison of the 2002 chemical consumption and quantity of soil processed with permit limitations.

## 3.2 Water Monitoring

The GJO monitors the surface water and ground water on and adjacent to the GJO facility. This section presents descriptions of monitoring performed in 2002 associated with the surface water and includes a brief summary for the discontinuance of the sewer effluent monitoring. Section 6.0 presents descriptions of ground water monitoring activities and results.

### 3.2.1 Sewer Effluent

The RTC facility sewer effluent consists of domestic sewage, including that from tenant businesses, and wastewater discharges from GJO operations, (i.e., Analytical Laboratory [Building 20], the Environmental Sciences laboratory [Building 32], and the microfiche processing center [Building 12]) (Figure 3−1). The RTC sewer system discharges to the city sewer, which is treated at the City of Grand Junction Publicly Owned Treatment Works.

From March 1989 to June 1999, the GJO facility was subject to the provisions of a Class II Industrial Pretreatment Permit issued under the authority of the City of Grand Junction's Industrial Pretreatment Program, Chapter 38 of the Code of Ordinance; the Colorado Water Quality Control Act; and the Federal Water Pollution Control Act as amended by the Clean Water Act of 1977. In accordance with the regulatory provisions of the Industrial Pretreatment Program and with the City of Grand Junction's approval, the GJO did not renew its Industrial Pretreatment Permit after it expired in June 1999 (DOE 2001a and Tonello 2001). Sampling of the sewer effluent by DOE for nonradioactive constituents continued as a best management practice during the first quarter of 2000, after which it was discontinued.

The site sewer effluent was monitored for radioactive constituents through the first quarter of 2000. This sampling was conducted to demonstrate compliance with the requirements of DOE Orders 5400.1 and 5400.5. In March 2000, the GJO received approval from the DOE

Albuquerque Operations Office to discontinue monitoring the sewer effluent for radioactive constituents. DOE Albuquerque's approval to discontinue monitoring was based on historically low activity levels in the effluent samples and GJO administrative controls to ensure continued compliance with DOE Order 5400.5.

Sewer effluent was not monitored for radioactive components or for hazardous constituents in 2002. Best management practices and procedures are used in the laboratories to ensure compliance with effluent parameters including pH, radioisotopes, total toxic organics, and mercury in accordance with City ordinances (GJ Code, Section 38-49). In addition, the GJO Analytical Laboratory maintains an automated batch neutralization unit that receives all laboratory analytical wastewater and performs neutralization to meet effluent standards prior to discharge into the facility sewer system.

Any new processes or significant changes to the existing laboratory processes or procedures will require the City's review prior to any discharge to the sanitary sewer system.

In September 2002, Stoller (the new GJO Technical Assistance Contractor) contacted the City Wastewater Administrator to discuss the site contractor transition and to inform the Administrator that GJO administrative policy and laboratory best management practices with respect to industrial wastewater discharge would remain the same; the City would be notified of any significant increase in the laboratory's quantity of samples or scope of work

***Sewer Effluent Monitoring for Radioactive and Nonradioactive Constituents***

The primary sources of radioactive and nonradioactive liquid discharges to the sewer system are the GJO Analytical Laboratory and the Environmental Sciences Laboratory (Building 32) (Figure 3−1).

Liquid waste containing low levels of radioactivity are generated in the course of environmental sample preparation and analysis and are discharged directly to the GJO sewer system. Administrative controls are in place to ensure that the level of radioactivity does not exceed levels established in DOE Order 5400.5, conservatively set at $1.5 \times 10^{-7}$ microcuries per milliliter (µCi/mL) (5,550 microbecquerels per milliliter [µBq/mL]) at the sewer outfall.

In 2001, a complete review of all waste management practices was conducted, including disposal options for aqueous process waste streams and excess aqueous samples. The intent of the waste management review was to clarify practices where appropriate and to provide more specific direction if necessary. The GJO Analytical Laboratory's current practice for disposal of aqueous process wastes and excess aqueous samples is acid neutralization to meet effluent pH standards prior to discharge to the city sewer system.

As a part of this waste management review, a baseline composition of the GJO Analytical Laboratory effluent was derived from calculations of chemicals contributed from the laboratory's analytical procedures, and also from the theoretical disposal of all aqueous client samples. Both process knowledge and analytical data from the current calendar year were used to calculate the values. The management practices currently exercised by the GJO Analytical Laboratory to maintain compliance with effluent limitations on pH, radioisotopes, and total toxic organics were also reviewed. It was concluded, and concurred by the city, that with the exception of mercury,

all discharges from the GJO Analytical Laboratory to the city sewer system meet the current local limits and all other discharge limitations contained in the city code of ordinances (Grand Junction Code, Section 38−49). Any new processes or significant changes to the existing laboratory processes or procedures will require the city's review prior to any discharge to the sanitary sewer system.

Mercury is subject to a "zero-discharge" effluent standard, which is interpreted by the City as less than 0.2 microgram per liter. Prior to analyzing for mercury, the laboratory prepares a process-specific analysis of all waste streams that will be generated during the mercury analysis and any other analyses requested, and determines the management provisions for these wastes. This waste management plan for controlling potential mercury discharges to the sewer system was approved by the city (DOE 2001a and Tonello 2001).

### 3.2.2 Surface Water

Surface water monitoring is conducted to verify compliance with State water quality standards and to detect changes in water quality resulting from remedial actions. Surface water sources at or near the GJO facility consist of the North Pond, South Pond, Wetland Area, and Gunnison River, all of which contain water year-round. The North Pond, South Pond, and Wetland Area are located on the GJO facility, and the Gunnison River is contiguous to the facility's west and north boundaries (Figure 3–2).

The wetland was created in spring 1994 from the excavation of contaminated soils during GJORAP operations. Although most of the wetland is dry during low ground water periods (September through March), a portion of the area was designed to contain water year-round for monitoring purposes; this area forms the sampling location called the Wetland Area. In 2002, at the request of CDPHE, three additional wetlands locations (WW-1, WW-2, and WW-3) were sampled to document the variability of water quality in the wetland.

In accordance with the Water Quality Control Commission regulation entitled "Classifications and Numeric Standards for Gunnison and Lower Dolores River Basins" (5 CCR 1002–35), the State has designated four use classifications for the segment of the Gunnison River near the GJO facility: (1) Recreation—Class I, (2) Cold Water Aquatic Life—Class I, (3) Domestic Water Supply, and (4) Agriculture. Table 5–3 lists the State water quality standards associated with these classifications and lists the more stringent standard if more than one exists. Where table value standards were adopted by the Water Quality Control Commission, the numerical criteria provided were used to determine the standard. These standards also were used to evaluate the water quality in the North Pond, South Pond, and Wetland Area.

The surface water sampling locations are near the shore of the Gunnison River adjacent to the facility (Upper Middle Gunnison), downstream of the facility (Lower Gunnison), near the western shores of the North and South Ponds, and at the Wetland Area (Figure 3–2). An upstream location on the Gunnison River (Upper Gunnison) was formerly sampled from 1982 through 2000 and will be referred to in the report when comparison to an upgradient (or background) river location is warranted. This river location, along with one of the two locations adjacent to the site were discontinued in CY 2001 following an evaluation of both the ground water and surface water monitoring performed at the GJO. This evaluation was conducted for management under the LTSM Program, which oversees site monitoring following the transition to private ownership that occurred in CY 2001.

Surface water samples are collected annually during January. Flows and water levels are typically low during this time of year, and contaminant concentrations are typically highest. Sampling during low water each year minimizes seasonal fluctuation and allows better assessment of the progress of natural flushing of contaminants in the surface water.

Locations sampled and analyses conducted for the GJO water-sampling program in 2002 are shown in Table 3−2. Analytes in Table 3−2 are used to characterize general water quality and to monitor the effects of alluvial ground water under the GJO facility on surface water quality. Historical and 2002 analyte concentrations in samples from the Gunnison River and the on-site ponds are compared with applicable State standards in Section 5.0, Tables 5–2 and 5−3, respectively.

*Table 3–2. GJO Water Sampling and Analytical Design Schedule*

| Month | Matrix | Locations Sampled | Analytes Measured |
|---|---|---|---|
| January | Ground Water | 10-19N, 11-1S, 14-13NA, 6-2N, 8-4S, GJ01-01, GJ01-02, GJ84-04 | Total alkalinity, ammonium, arsenic, chloride, chromium, dissolved oxygen, gross alpha, gross beta, manganese, molybdenum, nitrate, oxidation-reduction potential, pH, radium-226, radium-228, selenium, specific conductance, sulfate, temperature, total dissolved solids, turbidity, uranium, and vanadium |
| January | Surface Water | Lower Gunnison, Upper Mid Gunnison, North Pond, South Pond, Wetland Area, WW-1, WW-2, WW-3 | |

## 3.3 Environmental Remediation

Remediation under GJORAP was completed in 2001. GJORAP encompassed activities associated with the removal of uranium mill tailings and mill-related contamination from earlier GJO operations. All known on-site radioactive contamination of ground water, surface water, and soils and most of the building contamination is believed to be a result of those past activities. Remedial action site investigations formally began in 1984 when the facility was accepted into the DOE Surplus Facilities Management Program. The GJORAP remedial investigation/feasibility study report for the GJO (DOE 1989) was issued in July 1989 and the Record of Decision (DOE 1990) was issued in April 1990.

Removal of uranium mill tailings and contaminated soil began in late 1989, and most of the contamination was removed by 1994. Additional small deposits of contaminated soil subsequently were removed during remedial action activities conducted during 1998 through 2001. The total volume of uranium mill tailings and tailings-contaminated material removed from open land areas for the duration of the project was approximately 195,985 $m^3$ (256,340 $yd^3$). The tailings and related materials occupied approximately 13.5 hectares (33.3 acres). The primary locations of remediation included the North Pond and South Pond areas, areas located on the north and northwest of the property, and the dike along the Gunnison River.

In addition to soil, ground water, and surface water contamination, 24 buildings at the GJO facility at the start of GJORAP remediation in 1989 contained radiological contamination as a result of past uranium milling, sample preparation, and raw material procurement activities (Buildings 1, 2, 6, 7/7A, 12/12A, 18, 20, 28, 31, 31A, 32, 33, 34, 35, 36, 37, 39, 42, 44, 46, 52, 62, 938, and 3022). By the end of 2001, GJORAP had demolished 16 buildings and remediated and/or verified for release for unrestricted use the remaining 33 buildings present at the facility.

Although the structure of Building 12, which houses the GJO computer system, was remediated and released for unrestricted use, radiologically contaminated concrete and soil were left in place under the building so that operations in Building 12 could continue. Building 20, the GJO Analytical Laboratory, was approved by DOE–Albuquerque for release for unrestricted use following a release survey based on an approved derived concentration guideline level. Radiologically contaminated soil and debris were left in place under the southwest corner of the building so that laboratory operations could continue. GJO included these locations of contamination in the *Request for Deferred Remediation* (DOE 2000a).

## 3.4 Waste Management

The GJO generates small volumes of waste regulated under RCRA and TSCA, low-level waste (LLW), and mixed LLW (MLLW) (i.e., contaminated with radioactivity and RCRA- or TSCA-regulated constituents). The GJO also generates RRM in the form of excess samples and sample extracts derived from the UMTRCA Title I Project and programs. The GJO stores waste prior to off-site shipment to commercial or DOE-owned disposal facilities. Programs, policies, and procedures are in place to minimize waste generation and manage wastes that cannot be minimized in compliance with applicable Federal and State regulations and DOE directives.

### 3.4.1 RCRA-Regulated and Mixed Waste Management

Hazardous and MLLW at the site are generated primarily by the GJO Analytical Laboratory. The GJO stores hazardous and MLLW in satellite accumulation areas and in designated hazardous waste storage areas. Hazardous wastes are shipped off the site to commercial treatment and disposal facilities once or twice each calendar year, or as required by law. Because DOE leases the property from the RTC, responsibility for maintenance, including management of spent fluorescent light tubes, light fixtures and ballasts, lead-acid batteries, and miscellaneous property and wastes resides with the site owner.

The GJO implements strict characterization and segregation requirements (waste minimization efforts) to reduce the amount of waste classified and managed as hazardous or mixed. Administrative controls such as establishing radioactive materials areas, limiting the use of materials in contamination areas, and surveying wastes for segregation as radioactive or nonradioactive, further reduces the volume of MLLW generated at the GJO.

In 2002, the GJO operated as a CESQG by generating less than 100 kg (220 lb) per month and storing less than 1,000 kg (2,200 lb) of hazardous waste. Despite its CESQG status, the GJO maintains all programs necessary to operate as a small or large quantity generator if needed. Such programs generally include increased personnel training and facility record-keeping.

The GJO conducted one RCRA-regulated shipment in February 2002 that totaled 206 kg (453 lb). The shipment consisted of various expired laboratory chemicals that were lab-packed and transported for treatment and disposal by an EPA-licensed waste broker. The GJO currently stores a total of 106 kg (233 lb) of RCRA-regulated waste in satellite accumulation areas and waste storage areas.

### 3.4.2 PCBs and Asbestos

PCB waste generated in 2002 totaled 0.35 kg and is currently stored in a TSCA-compliant storage area. No asbestos wastes were generated in 2002. About 15 kg (33 lb) of RRM-contaminated PCB light ballasts were generated in April 2001 and disposed of at the Grand Junction Disposal Cell in May 2002. Approximately 45 kg (99 lb) of PCB waste generated in the fourth quarter of 2001 was shipped off site for disposal in February 2002.

The GJO Analytical Laboratory occasionally uses very small quantities of PCBs as reference standards for PCB analysis. As asbestos or PCB waste is generated, process knowledge or radiation surveys are used to determine whether the material is also contaminated with RRM and must be managed as a radioactive waste. At the GJO:

- Nonradioactive asbestos waste is disposed of in the Mesa County Landfill.
- Radioactive asbestos is disposed of as RRM at the Grand Junction Disposal Cell.
- Nonradioactive PCB wastes are shipped off site for treatment and disposal.
- Radioactively contaminated PCB wastes are stored on site awaiting commercial disposal. If the PCB waste is contaminated with RRM, risk-based approvals for disposal in the Grand Junction Disposal cell is sought.

### 3.4.3 Residual Radioactive Materials

RRM is defined by 40 CFR 192, Section 192.01, as "(1) Waste (which the Secretary determines to be radioactive) in the form of tailings resulting from the processing of ores for the extraction of uranium and other valuable constituents of the ores; and (2) Other wastes (which the Secretary determines to be radioactive) at a processing site which relate to such processing, including any residual stock of unprocessed ores or low-grade materials."

Remote UMTRCA Title I-related GJO projects and programs frequently send RRM-contaminated soil and water samples to the GJO Analytical Laboratory. Excess soil samples, soil sample extracts, and associated laboratory wastes are considered contaminated with RRM and are disposed of at the Grand Junction Disposal Cell. Any RRM remaining or discovered at the RTC facility is disposed of at the Grand Junction Disposal Cell, as well.

Under an agreement with the City of Grand Junction, if tailings, ore material, or other RRM is unearthed during City road construction activities, this material will be placed in temporary storage and then taken to the Grand Junction Disposal Cell during its annual scheduled operating period. Transportation of RRM is the responsibility of the City; decontamination of the trucks and disposal of the waste is the responsibility of the GJO.

In CY 2002, approximately 5,248 kg (11,546 lb) of RRM was shipped from the GJO to the Grand Junction Disposal Cell. The bulk of this shipment (4,990 kg or 10,978 lb) consisted of large instrument calibration models used during the UMTRA Project tailings removal operations. Other RRM wastes included UMTRCA Title I-related excess samples and associated wastes, and personal protective equipment.

### 3.4.4 Low-Level Waste Management

Radioactive wastes that are clearly not RRM do not qualify for disposal at the Grand Junction Disposal Cell and must be managed as LLW in compliance with DOE Order 435.1, *Radioactive Waste Management*. The GJO generates LLW from the analysis of environmental samples received from other DOE sites. Typical LLW includes soil sample residues; excess sample materials; contaminated sand derived from the cleaning of sample grinders and blenders; laboratory debris such as planchettes, filters, latex gloves, paper wipes, and glassware; and resins used for radionuclide separation of samples from projects that are not UMTRA-related. Occasionally, the GJO generates LLW as fluids from decontamination of treatability study equipment and excess radioactive sources.

The GJO has implemented strict radiological characterization and segregation requirements (waste minimization efforts) to reduce the amount of waste classified and managed as LLW. Administrative controls such as the establishment of radioactive materials areas, limiting the use of materials in those areas, and surveying wastes for segregation as contaminated or noncontaminated further reduces the volume of LLW.

The GJO generated approximately 71 kg (156 lb) of LLW in CY 2002. The GJO did not conduct a LLW shipment in CY 2002. Also, in storage is a 55-gallon drum containing 105 kg (231 lb) of LLW generated in previous years that has not been shipped off site due to the presence of an isotope, polonium 209, that is not easily accepted by a disposal facility. A total of 534 kg (1,175 lb) of LLW is currently managed on-site in waste storage (Building 61D on Figure 1−2). LLW and MLLW are stored in a separate dedicated building to minimize exposure to workers and to isolate the materials from the environment.

## 3.5 Pollution Prevention

The GJO actively incorporates pollution prevention as part of a larger goal of prudent environmental management. Wastes generated from GJO operations are reduced at the source wherever technically and economically feasible. Recycling options are explored for wastes that cannot be prevented though source reduction. Treatment options are considered for wastes that cannot be prevented or recycled. Disposal is the final option after all other avenues have been considered.

In February 2002, the GJO Analytical Laboratory generated 9.6 kg (21.1 lb) of liquid scintillation cocktail, which contains a flammable liquid. This waste was stabilized and solidified in Portland cement in May 2002. The treatment rendered the waste nonregulated, and it was subsequently disposed of at the county landfill.

### 3.5.1 Source Reduction

Source reduction at the GJO is achieved primarily through making usable materials accessible to other sites or agencies of the federal government, material substitution, and waste segregation. The GJO places unused or reusable materials on lists that are accessible to other government agencies for their operations. Substitution involves replacing a hazardous material with a less hazardous or nonhazardous material. Examples include replacing hazardous solvents and scintillation fluids with nonhazardous substitutes.

The GJO uses relatively few hazardous materials, most of which are required for laboratory analytical procedures; thus, the potential for reduction through substitution is small. In 2002, the GJO was able to find a federal agency that needed 2.5 cases of unused calcium carbide, a hazardous chemical, thus achieving a source reduction of 16 kg. The containers were delivered to the agency in June 2002.

Waste segregation involves separating hazardous from nonhazardous materials, and separating radiologically contaminated materials from noncontaminated materials. Examples include use of ALARA principles to keep materials from becoming radiologically contaminated, and use of radiological surveys to segregate radioactive from nonradioactive waste.

The GJO actively attempts to reduce wasteful practices and to replace inefficient equipment. For example, employees are encouraged to use their computers to reduce the amount of paper waste, and many manuals and administrative documents are available on-line rather than as paper copies.

### 3.5.2 Reuse and Recycling

The GJO generates several types of hazardous and nonhazardous waste that are suitable for recycling or reuse. These materials include used oil, nickel-cadmium (NiCad) batteries, scrap metal, office paper, cardboard, aluminum cans, glass, plastic, and lead-acid batteries.

Normal operations such as replacing batteries in electric vehicles and radios generate spent batteries. The GJO routinely recharges NiCad batteries, then reconditions the batteries to increase the number of possible recharges. NiCad batteries are sent to a recycling facility when the batteries can no longer be recharged. Lead-acid batteries from vehicles are sent to a local recycler.

The GJO regularly recycles office paper, cardboard, glass, plastics, steel, aluminum, magazines, and newspaper through a local recycling service. In 2002, the site recycled about 28,000 kg (61,600 lb) of these materials

The GJO recycled 718 grams of platinum ware and 260 grams of 5 percent gold/platinum alloy to the DOE Center for Precious Metals Sales and Recovery in Tennessee during February 2002.

The GJO generates used oil from equipment maintenance and recycles the used oil at an appropriate processing, re-refining, or fuel burning facility on a regular basis. The GJO generated 75.7 liters (which equates to approximately 61.3 kg or 135 lb) of used oil in 2002; this oil was recycled through a local company in January 2003.

Many materials at GJO are not wastes because they are still usable without reprocessing. These materials include computers and associated equipment. GJO donated about 272 computers and related items to School District 51 during 2002.

### 3.5.3 Affirmative Procurement

The GJO purchases materials with recycled content whenever practical. These efforts are coordinated under the Contracts and Procurement group as part of their affirmative procurement

program. The affirmative procurement program favors the acquisition of environmentally preferable and energy-efficient products and services.

The Contracts and Procurement group routinely adds language to contracts that specifies a preference for the use of recycled or otherwise recovered materials and removes language that prohibits the use of recycled materials.

New and renewed purchase orders for hazardous materials at the GJO are reviewed before commitment of funds. This review allows the GJO to track hazardous materials kept on site, and includes a discussion with the requestor to determine whether alternate compounds or materials could be substituted for the hazardous materials and could thus reduce or eliminate the generation of hazardous waste.

End of current text

# 4.0 Environmental Radiological Program Information

Environmental radiological monitoring programs at the GJO facility include sampling and estimation of air emissions and sampling surface water and ground water. Results of air emissions and surface water monitoring are described in this section, and the ground water program and monitoring results are described in Section 6.0.

## 4.1 Radiological Air Emissions

The only point-source monitoring conducted at the GJO facility during CY 2002 consisted of iso-kinetic sampling of radioparticulate air emissions from the Sample Plant (Building 46). With the completion of GJORAP and the removal of most residual radiological contaminants (i.e., non-point sources) from the GJO facility in 2001, environmental monitoring of radioparticulate air emissions from non-point sources was discontinued after 2001.

### 4.1.1 Point Source Radionuclides

For the purposes of determining compliance with the NESHAP Subpart H standard, radiological emissions from point sources (i.e., both the GJO Analytical Laboratory and the Sample Plant) were estimated according to guidelines in 40 CFR 61, Appendix E. Use of Appendix E as an alternative procedure relative to Section 61.93(a) of Subpart H was authorized in the *Memorandum of Understanding Between the U.S. Environmental Protection Agency and the U.S. Department of Energy concerning the Clean Air Act Emission Standards for Radionuclides, 40 CFR Part 61 Including Subparts H, I, Q, and T* (signed 09/29/94). Appendix E to Part 61 states that "… a facility may be found in compliance (with the standard) if the quantity of radioactive material possessed during the year is less than that listed in a table of annual possession quantities." Table 1 of Appendix E provides the "Annual Possession Quantities for Environmental Compliance" and is used for determining if a facility is in compliance with the standard.

As recommended in Appendix E of Part 61, EPA's *A Guide for Determining Compliance with the Clean Air Act Standards for Radionuclide Emissions* (EPA 1989) was used as guidance in evaluating GJO's annual possession quantity of radioactive materials. According to EPA's Guidance, "…There are several approaches (for demonstrating compliance) because of the diversity of facilities regulated by the standard. The simplest methods do not estimate the radiation dose **directly**. Instead, they determine whether your emissions could not cause a dose greater than the standard." GJO has determined that using the possession table from Appendix E to determine compliance with the NESHAP standard is appropriate to the level of DOE's operations and activities at the GJO. Worksheets B and E from EPA's guidance document were used to determine if quantities of individual radioisotopes exceeded their corresponding values from the possession table found in Appendix E. Table 4−1 provides a summary of the quantities of radioisotopes processed by the sample preparation facility and the GJO Analytical Laboratory during CY 2002.

*Table 4–1. Summary of Activity Levels of Materials Processed at the GJO During CY 2002*

| Radioisotope | DOE−GJO Possession Quantities -CY 2002 (Ci/yr) | Annual Possession Quantity(Ci/yr) - Appendix E, Table 1 |
|---|---|---|
| Cs-137 | 1.1E-07 | 2.3E+01 |
| Pb-210 | 1.1E-07 | 5.5E+01 |
| Po-210 | 3.7E-07 | 9.3E+01 |
| K-40 | 2.5E-05 | 6.8E+01 |
| Ra-226 | 1.4E-05 | 5.5E+00 |
| Th-228 | 2.0E-07 | 2.9E+00 |
| Th-230 | 2.5E-05 | 3.2E+00 |
| Th-232 | 7.8E-06 | 6.0E-01 |
| U-234 | 3.8E-07 | 7.6E+00 |
| U-235 | 1.9E-08 | 7.0E+00 |
| U-238 | 9.3E-06 | 8.6E+00 |
| Total U | 3.4E-05 | NA |
| **Total Activity - All Isotopes for CY 2002** | 1.2E-04 | NA |

As shown in this table, none of the isotopes quantities exceeded the allowable possession quantities from Table 1 of Appendix E. This comparison shows that the quantities of individual radioisotopes processed (i.e., possessed) by the GJO during CY 2002 are several orders of magnitude below their corresponding annual possession values listed in Appendix E. Also the total (summed) activity for all radioisotopes processed at this facility during CY 2002, is well below the possession quantity allowed for *any single* radioisotope identified in Table 1 of Appendix E. Therefore, based upon the total activity of materials processed at the GJO during CY 2002, emissions from this facility could not cause a dose greater than the standard. The GJO facility was in full compliance with the NESHAP Subpart H standard during CY 2002. No unplanned releases (i.e., airborne emissions) of radioactivity occurred at the GJO in 2002.

## 4.2 Surface Water

### 4.2.1 Gunnison River

Radionuclide concentrations in samples collected from the Gunnison River in 2002 were below applicable standards in the CDPHE Water Quality Control Commission's Regulations 31 and 35 (surface water quality standards). Historical and 2002 maximum radionuclide concentrations in the Gunnison River are presented and compared with applicable surface water quality standards in Section 5.3, Table 5−2. Appendix A presents the Gunnison River surface water sampling results for 2002.

Uranium concentrations in 2002 were relatively constant in the Gunnison River samples with respect to sampling locations. Uranium results were well below the 40 pCi/L standard (Section 5.3, Table 5–2). No significant increase or decrease in uranium concentration was observed when the analytical results of upstream samples were compared to results from downstream samples.

Following remediation (early 1990s), uranium concentrations in samples from locations on the Gunnison River upstream, adjacent to the site, and downstream were generally between 5 and

10 pCi/L total uranium—well below the standard of 40 pCi/L. Appendix B shows uranium concentrations measured from January 1992 through January 2002. Appendix A shows uranium reported for the downstream location (Lower Gunnison) and the location adjacent to the site (Upper Mid-Gunnison) in CY 2002. The Gunnison River surface water concentrations of uranium will continue to be monitored for changes that may result from passive remediation (natural flushing) of ground water at the GJO facility.

The Gunnison River surface water samples were also analyzed for radium-226, radium-228, gross alpha, and gross beta activity. Concentrations of radium-226 and radium-228 were near (radium-226) or below (radium-228) the detection limit in samples collected from Gunnison River locations. Concentrations also were well below the combined radium-226 + radium-228 standard of 5 pCi/L, as shown in Table 5−2. Gross alpha and gross beta activities also were near or below the detection limits.

### 4.2.2 North Pond, South Pond, and the Wetland Area

Water in the North Pond, South Pond, and the Wetland Area is recharged by the shallow alluvial aquifer underlying the facility and shows the same radioactive characteristics as the aquifer. Appendix A presents the North Pond, South Pond, and the Wetland Area surface water sampling results for 2002. The surface water quality standard used for the Gunnison River samples (40 pCi/L) (0.058 mg/L) was used to evaluate uranium concentrations in samples from the North Pond, South Pond, and all wetland locations. Concentrations of uranium in all samples collected from the site surface water locations (i.e., the North Pond, South Pond, and the wetland locations) exceeded the Gunnison River standard in 2002. The maximum uranium concentration of 1,628 pCi/L (2.37 mg/L) was detected in the sample from wetland location WW-2. Uranium concentrations in the North Pond, South Pond, and the Wetland Area samples are presented and compared with the applicable surface water quality standard in Section 5.3, Table 5–3. Appendix B shows time-concentration plots of uranium concentrations versus time in the North Pond, South Pond, and the Wetland Area.

The North Pond, South Pond, and Wetland Area samples were also analyzed for gross alpha and gross beta. Gross alpha and gross beta activities in these samples were elevated and correlate to the elevated uranium concentrations. No surface water quality standards currently exist for these constituents for comparison.

Surface water quality is expected to mirror ground water quality because the on-site surface water sources are recharged by alluvial ground water. When 2002 surface water results are compared to historical maximum concentrations (Table 5−3), surface water quality at the GJO has improved. Surface water quality should continue to improve over time as passive remediation (natural flushing) of the alluvial aquifer continues. Ground water modeling of the alluvial aquifer predicts that concentrations of contaminants in ground water and water in the on-site ponds will be below applicable standards within 50 to 80 years after mill tailings removal. This 50- to 80-year period is within the 100-year cleanup period required under UMTRCA ground water regulations (40 CFR 192) as indicated in the GJORAP Record of Decision (DOE 1990).

End of current text

# 5.0 Environmental Nonradiological Program Information

The GJO monitors and estimates nonradiological air emissions from the Analytical Laboratory and samples nonradiological analytes in the GJO ground water and surface water. This section presents analytical results of nonradiological air emissions monitoring and surface water samples. Results for both nonradiological and radiological ground water monitoring are presented in Section 6.0. There were no releases of nonpermitted hazardous substances or other unplanned releases at the GJO in 2002.

## 5.1 Nonradiological Air Emissions

An assessment of nonradiological air emissions at the GJO facility includes monitoring of opacity if required, annual chemical consumption, and annual quantity of soil processed by the GJO Sample Plant.

No observations of visible emissions (opacity) from facility stationary sources were required in 2002.

### 5.1.1 Permitted Releases

The annual record of chemical consumption by the Analytical Laboratory, required by Air Emission Permit No. 90ME402–1, is summarized in Table 5–1. Chemical consumption by the Analytical Laboratory was calculated from 2002 purchase records and inventory quantities. As shown in Table 5−1, the actual consumption rates for all listed chemicals were well below the allowable annual chemical consumption rates specified in the emission permit.

The quantity of soil processed by the Sample Plant during CY 2002 was 56 pounds which is 0.04 percent of the permitted annual quantity of 66 tons stated in the APEN/permit exemption. The records of chemical consumption and quantity of soil processed show that no limits were exceeded in 2002.

*Table 5–1. Annual Record of Chemical Consumption by the Analytical Laboratory—CY 2002*

| Chemical | Permitted Annual Consumption | Actual Annual Consumption-CY 2002 | Percent of Permitted Annual Consumption |
|---|---|---|---|
| Acids | 900 gallons (3,407 liters) | 218.6 gal. (827.4 L) | 24.3 |
| Volatile Organic Compounds | 2,000 gallons (7,571 liters) | 80.3 gal. (303.9 L) | 15.2 |
| Benzene | 13 gallons (49 liters) | 1.1 gal. (4.2 L) | 8.5 |

## 5.2 Nonradiological Surface Water Sampling and Analysis

### 5.2.1 Gunnison River

Nonradiological analyte concentrations in samples from the Gunnison River in 2002, with the exception of manganese and selenium, were below or within acceptable ranges of applicable State standards. Historical and 2002 maximum analyte concentrations in the Gunnison River are presented and compared with current applicable State standards in Table 5–2. Appendix A presents the Gunnison River surface water sampling results for 2002. That table contains

analytical results for several constituents that are not presented in Table 5–2 because no surface water quality standards currently exist for these constituents.

*Table 5–2. Comparison of State Surface-Water-Quality Standards to 2002 and Historical Maximum Concentrations in the Gunnison River*[a,b]

| | | 2002 Results | | Historical Maximum[c] | | |
|---|---|---|---|---|---|---|
| **Constituent** | **State Standard** | **Adjacent to Site (Upper Mid Gunnison)** | **Downgradient (Lower Gunnison)** | **Upgradient** | **Adjacent to Site** | **Downgradient** |
| **Common Ions (mg/L)** | | | | | | |
| Chloride | 250.0 | 7.77 | 16.7 | 12.4 | 12.6 | 80 |
| Nitrate[d] | 44.27 | 4.81 | 5.62 | 26.56 | 26.56 | 26.56 |
| Sulfate | 480 | 330 | 398 | 513 | 512 | 584 |
| **Field Measurements** | | | | | | |
| Dissolved Oxygen[e] | 7.0 mg/L | 12.56 | 12.34 | 9.5 | 9.3 | 9.5 |
| pH | 6.5-9.0 | 8.47-8.47 | 8.14-8.14 | 7.20-9.04 | 7.29-9.19 | 7.33-9.01 |
| **Metals (mg/L)[f]** | | | | | | |
| Arsenic | 0.05 | 0.0009 | <0.0006 | 0.011 | 0.0086 | 0.011 |
| Chromium+6 | 0.011 | <0.0008 | <0.0008 | 0.0092 | 0.0123 | 0.0057 |
| Manganese | 0.050 | 0.0324 | 0.100 | 0.2 | 0.0766 | 0.122 |
| Selenium | 0.008 | 0.0088 | 0.0081 | 0.0096 | 0.014 | 0.0148 |
| **Radiological (pCi/L)** | | | | | | |
| Radium-226+228 | 5.0 | 0.11 | 0.13 | 16.8 | 15.5 | 16.3 |
| Uranium[g] | 40 | 5.63 | 9.62 | 10.42 | 14.39 | 23.36 |

[a]CDPHE Water Quality Control Commission surface water standards; Regulations 31 and 35, effective March 2, 1999, and January 30, 1999, respectively.
[b]"<" indicates that the maximum concentration was below the detection limit (number shown is detection limit)
[c]Based on maximum concentrations detected from 1980 through 2001.
[d] Nitrate standard "as N" (and some measured values) was converted to nitrate using the conversion $N0_3$ = N x 4.427.
[e]The standard value for dissolved oxygen represents a minimum concentration. Measured values must be greater than 7.0 mg/L to comply with this standard. Listed values represent the minimum concentrations measured.
[f]All values given are for dissolved constituents.
[g]Uranium concentrations measured in milligrams per liter were converted to picocuries per liter for activity using a conversion factor of 687 pCi/mg.

Manganese and selenium were the only constituents reported in samples collected from the Gunnison River in 2002 with concentrations that exceeded a surface water standard. The manganese concentration in the sample collected from the Lower Gunnison location was 0.100 mg/L, which exceeds the standard of 0.05 mg/L. Selenium concentrations measured in samples collected from both Gunnison River locations slightly exceeded the standard of 0.008 mg/L (Table 5−2). As shown in the time-concentration graphs (Appendix B), concentrations of these constituents have exceeded the standard periodically during the past. Because the Gunnison River receives ground water discharge from the contaminated alluvial aquifer, occasional increases in concentrations are expected, particularly during low flows of the Gunnison River in drought conditions, which occurred in 2002.

Because molybdenum concentrations exceeded the applicable ground water standard in 2002 alluvial ground water samples, surface water concentrations for this constituent will continue to be monitored; however, molybdenum concentrations in the samples collected from Gunnison River locations in 2002 were below detection. Time-concentration graphs for molybdenum in samples from the Gunnison River are included in Appendix B.

### 5.2.2 North Pond, South Pond, and the Wetland Area

The North Pond, South Pond, and Wetland Area historically contained elevated quantities of some chemical constituents typically associated with uranium mill tailings (e.g., manganese, molybdenum, selenium, and sulfate). As with the radionuclides, Gunnison River surface water quality standards were used to evaluate concentrations of nonradiological analytes in the North Pond, South Pond, and Wetland Area. Appendix A presents the 2002 sampling results for these surface water analytes.

Chloride, manganese, pH, and sulfate values in samples collected from the North Pond, South Pond, and wetland locations in 2002 exceeded surface water quality standards for those analytes in at least one location. Table 5–3 shows 2002 locations where concentrations of these constituents (along with uranium) exceed State standards and are compared with historical maximum values. Appendix B shows time-concentration plots for manganese, molybdenum, and selenium. Future sampling of the North Pond, South Pond and Wetland Area will continue to monitor these constituents.

*Table 5–3. On-site GJO Surface Locations with Concentrations that Exceeded Gunnison River Standards in January 2002*

| Analyte | Standard[a,b] | Historical Maximum Location (Concentration)[b] | 2002 Locations Exceeding Standards (Concentration[b]) |
|---|---|---|---|
| Chloride | 250.0 | Wetland Area (3,830) | North Pond (775), Wetland Area (1,800), WW-1 (459), WW-2 (2,200), WW-3 (1,010) |
| Manganese | 0.05 | South Pond (3.86) | WW-1 (0.0533), WW-2 (0.0966), Wetland Area (0.0923) |
| pH | 6.5 – 9.0 | South Pond (10.4) | WW-2 (9.18), Wetland Area (9.1) |
| Sulfate | 480 | Wetland Area (45,200) | North Pond (7,300), South Pond (1,430), Wetland Area (22,000), WW-1 (3,520), WW-2 (25,500), WW-3 (11,600) |
| Uranium[c] | 40 | South Pond (13,053) | North Pond (195.79), South Pond (184.12), Wetland Area (1,195.38), WW-1 (569.52), WW-2 (1,628.19), WW-3 (504.95) |

[a]Standards are CDPHE Water Quality Control Commission surface water standards, regulation 31 and 35
[b]Units are in mg/L, except for uranium (pCi/L) and pH (s.u.).
[c]Uranium concentrations measured in mg/L were converted to activity using a conversion factor of 687 pCi/mg.

End of current text

# 6.0 Ground Water Monitoring and Protection Program

Ground water in the alluvial aquifer beneath the GJO facility is contaminated from leached constituents of uranium mill tailings generated during milling operations. Uranium mill tailings removal from open-land areas on the facility began in late 1989, and most of the tailings and contaminated soil were removed from those areas by 1994. Modeling of the alluvial aquifer predicts that concentrations of ground water contaminants will be below applicable standards within 50 to 80 years after removal of the contaminant source (DOE 1990).

The objective of the ground water monitoring and protection program is to verify improvement in ground water quality and to verify the effectiveness of natural flushing of the alluvial aquifer. This section characterizes the GJO hydrogeology, describes the 2002 ground water sampling and analysis activities, provides ground water analytical results, and interprets trends in ground water remediation to date. Responsibility for the ground water monitoring program was transferred to the LTSM Program in September 2000.

## 6.1 Hydrogeology

Two hydrogeologic units are of importance at the GJO facility: the unconsolidated alluvial aquifer along the Gunnison River and the underlying Morrison Formation aquitard. These two units and the Gunnison River itself influence ground water flow and discharge into the river.

The alluvial aquifer consists of two facies: a poorly sorted, unconsolidated basal gravel unit with a silt and sand matrix and an overlying unit of silty sand (Figure 6–1). Well logs from 1984 well installations indicate that both units are laterally continuous throughout the GJO site. The portion of the alluvial aquifer underlying the GJO facility occupies about 22.8 ha (56.4 acres) of the Gunnison River floodplain; its thickness ranges from 6 to 21 meters (20 to 70 feet) but averages between 6 and 8 meters (20 and 25 feet). Bounded on the west and north by the river and on the east by the shales and sandstones of the Morrison Formation, the aquifer is open to the south where the alluvium continues along the east boundary of the river. Aquifer pumping tests show that the hydraulic conductivity of the alluvium is approximately 9 meters (30 feet) per day, and the specific yield is on the order of 0.05. Generally, depth to ground water ranges from 1.5 to 3 meters (5 to 10 feet). Currently, the alluvial ground water is not used for any purpose.

Field observations suggest that a simple depositional model is adequate to represent the alluvial aquifer. The basal portion was deposited as the Gunnison River migrated from the east to its present position. During this migration, older alluvial sediments to the west were eroded, and a new layer of sediment was left behind. This deposition resulted in a continuous layer of gravel, sand, and silt.

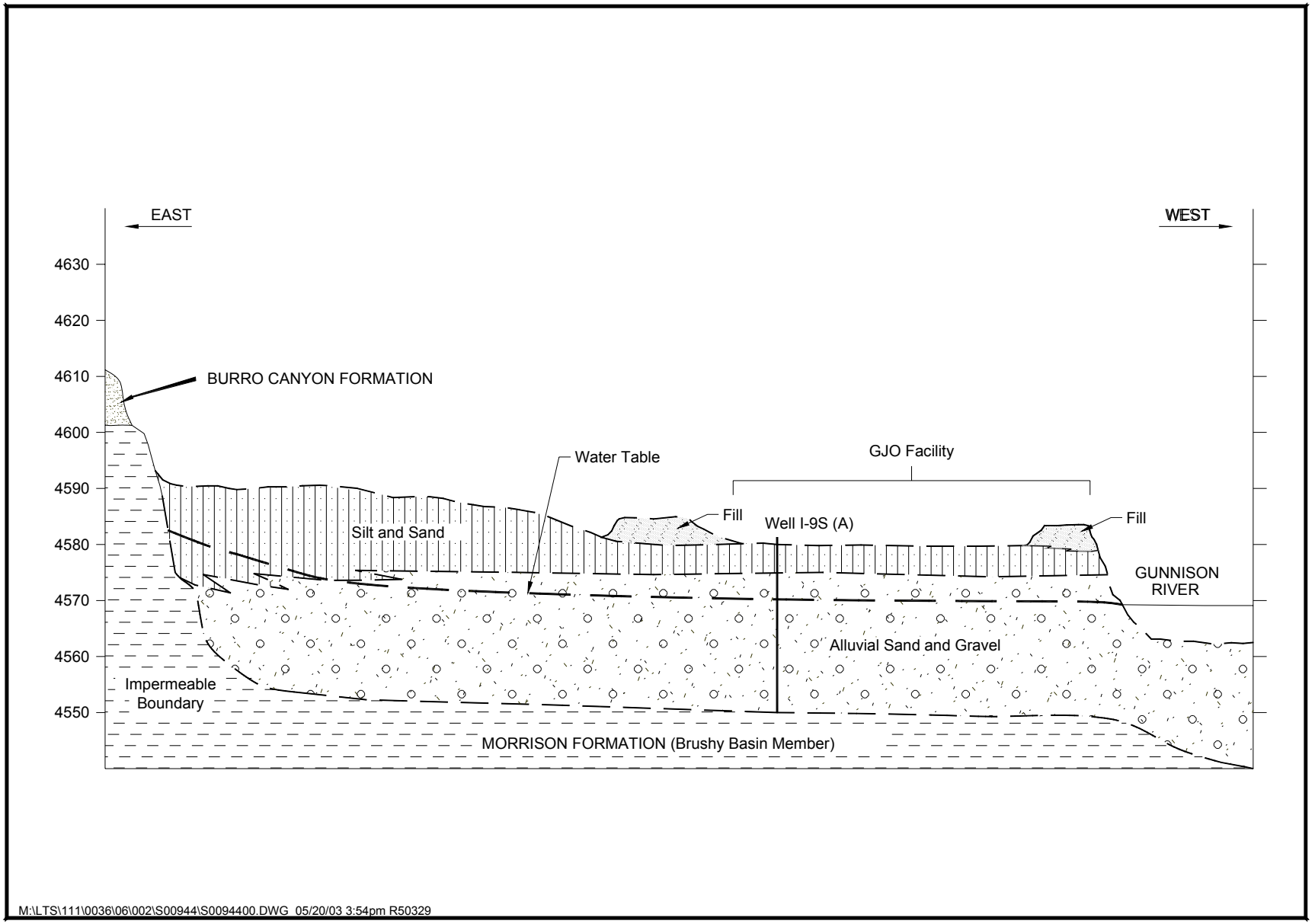



*Figure 6–1. Typical Geologic Cross Section of the Alluvial Aquifer Underneath the GJO Facility*

Periodic flood events deposited sand and silt on top of the gravel to produce the alluvial stratigraphy shown in Figure 6–1. Such a depositional model is similar to the alluvial-floodplain facies model of Allen (1970); the primary difference between the two is that the alluvium at the GJO facility was deposited in an area that was more restricted laterally, and where, as a result, the water flowed more swiftly. The result is a thicker and more consistent basal gravel unit than the Allen model would indicate. Figure 6–2 presents a typical stratigraphic column at the GJO facility.

Upgradient ground water (southeast of the facility) has water quality characteristics similar to those of the Gunnison River, although major ion concentrations increase slightly as the ground water residence time increases. Before uranium mill tailings were removed from the facility, ground water flowing beneath the facility became contaminated with the leached constituents of uranium mill tailings—uranium, arsenic, radium, selenium, and molybdenum. Only uranium and molybdenum, however, were mobile enough to migrate throughout the downgradient portion of the aquifer.

Underlying the alluvial aquifer at the GJO facility is the Morrison Formation, which in the Grand Junction area consists of the Brushy Basin and Salt Wash Members. The formation is composed primarily of shale, although minor lenticular sandstones are present in the upper Brushy Basin Member, and increasing sandstone facies occur in the Salt Wash Member. The Morrison Formation serves as an aquitard beneath the facility, inhibiting downward ground water flow and preventing hydraulic communication between the overlying alluvial aquifer and the underlying Entrada Sandstone aquifer.

At the GJO facility, the Gunnison River incises only the upper part of the Brushy Basin Member. Brushy Basin shales are exposed along the valley margins and underlie the alluvium. This framework results in free-flowing ground water in the alluvial aquifer because Brushy Basin shales act as a relatively impermeable boundary beneath the aquifer and along the valley margins.

Recharge of the alluvial aquifer occurs mainly through fluctuations in the Gunnison River and, to a much lesser extent, precipitation. During normal flows of the Gunnison River, ground water enters the alluvial aquifer from the river along the southern perimeter of the GJO facility and flows to the north. Ground water is discharged into the river along the north and west boundaries of the facility. During periods of high river flow, Gunnison River water recharges the alluvial aquifer, and ground water flow is toward the middle of the aquifer.

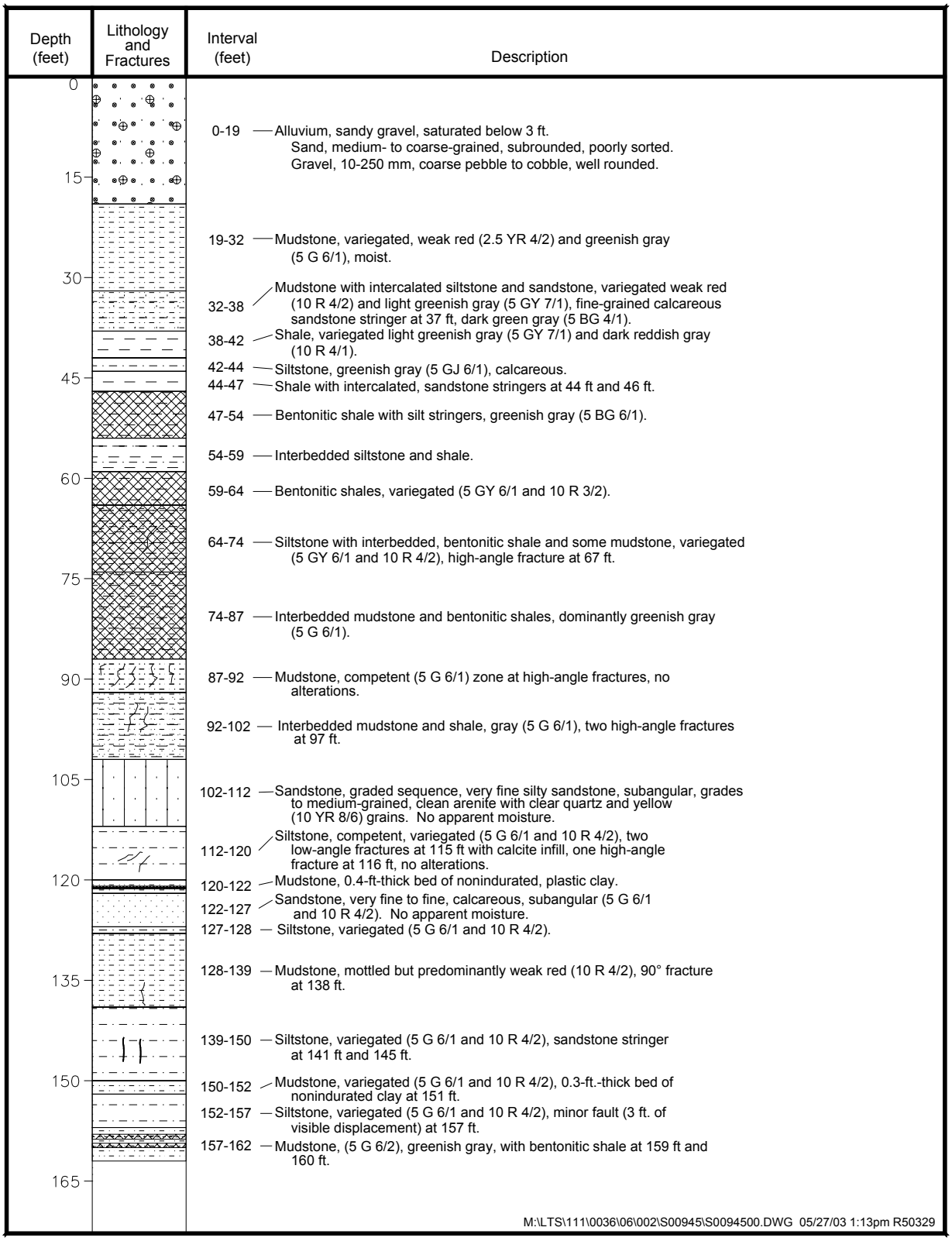



*Figure 6–2. Typical Stratigraphic Column at the GJO Facility*

## 6.2 Ground Water Sampling and Analysis

In 2002, GJO ground water monitoring involved one sampling event. DOE continued ground water sampling under a long-term monitoring strategy that was designed to verify the progress of natural flushing of the alluvial aquifer in the 50- to 80-year period predicted in the Record of Decision (ROD)(DOE 1990). At the request of the State of Colorado, monitoring is performed at the same time every year (in the winter, when historical data indicate the highest contaminant concentrations occurred as a result of the low-flow conditions) to minimize seasonal fluctuations.

In 2000, at the direction of DOE–GJO, the LTSM Program evaluated the ground water and surface water monitoring strategy at the GJO facility. The purpose of the evaluation was to determine the feasibility of decreasing the number of monitoring locations and analytes, while maintaining the objectives and regulatory requirements of the monitoring program. Based on this evaluation, 42 of 48 wells were decommissioned in CY 2000, leaving 6 wells for ongoing monitoring purposes. Included are five on-site wells (8–4S, 6–2N, 11–1S, 14–13NA, and 10−19N) and one downgradient well (GJ84–04) (Figure 6−3). The upgradient well (GJ84–09) was decommissioned, leaving only historical data for background comparison. The wells were decommissioned in accordance with the State of Colorado Water Well Construction Rule 15 (2 CCR 402–2). In 2001, two wells (GJ01-01 and GJ01-02) were added to the long-term monitoring network to monitor potential impacts from soil contamination left in place around Building 20. Because the soil contamination is shallow, ground water contact with the contamination is not expected.

The 2002 ground water samples were collected in January according to sampling procedures and protocol described in the *Sampling and Analysis Plan for the UMTRA Ground Water Project* (DOE 2001c). The ground water monitoring program is detailed in the Environmental Monitoring Plan (DOE 2001b).

Monitor wells sampled and the constituents analyzed are summarized in Table 3−2. These wells are in or downgradient of formerly contaminated areas of the facility and represent on-site and downgradient conditions. Monitor well locations sampled in 2002 are shown in Figure 6−3.

## 6.3 Ground Water Analytical Results and Trends

During 2002, concentrations of uranium, molybdenum, selenium, and total dissolved solids in samples from the alluvial aquifer exceeded ground water quality standards (Table 6−1). Table 6−2 lists 2002 and historical maximum analyte concentrations compared with Federal and State ground water quality standards. Both tables combine Federal and State standards for comparison and list the more stringent standard if more than one exists.

*Table 6–1. GJO Wells with Sample Concentrations that Exceeded Ground Water Standards in January 2002*

| Analyte | Standard[a] | Wells Exceeding Standards (Concentration[a]) |
|---|---|---|
| Molybdenum | 0.100 | 14-13NA (0.221), 8-4S (0.256), GJ01-01 (0.151), GJ84-04 (0.111) |
| Selenium | 0.010 | 6-2N (0.116), 8-4S (0.0509), GJ01-01 (0.0634) |
| Total Dissolved Solids | 2,210 | 10-19N (4,480), 14-13NA (2,860), 6-2N (2,350),GJ84-04 (2,430) |
| Uranium-234 + 238[b] | 30 | 10-19N (146.28), 11-1S (81.19), 14-13NA (163.05),6-2N (179.83), 8-4S (391.19), GJ01-01 (340.2),GJ01-02 (148.96), GJ84-04 (110.04) |

[a]Standards are listed in 40 CFR 192.02 Table 1 to subpart A; units are in mg/L, except for uranium, which is in pCi/L.
[b]Uranium concentrations measured in mg/L were converted to U-234 + U-238 activity using a conversion factor of 671 pCi/mg.

*Table 6–2. Comparison of Federal and State Ground Water Quality Standards to 2002 and Historical Maximum Concentrations in the Alluvial Aquifer[a,b,c]*

| | | 2002 Maximum | | Historical Maximum[d] | | |
|---|---|---|---|---|---|---|
| Constituent | Federal/State Standard | On-Site | Downgradient (GJ84-04) | Upgradient | On-Site | Downgradient |
| **Common Ions (mg/L)** | | | | | | |
| Nitrate[e] | 44.27 | 37.6 | 0.673 | 7 | 308 | 16 |
| Total Dissolved Solids[f] | 2,210 | 4,480 | 2,430 | 2,180 | 10,200 | 8,620 |
| **Metals (mg/L)** | | | | | | |
| Arsenic | 0.05 | 0.010 | 0.010 | 0.0114 | 0.68 | 0.031 |
| Chromium | 0.05 | <0.0008 | <0.0008 | 0.010 | 0.039 | 0.112 |
| Molybdenum | 0.1 | 0.256 | 0.111 | 0.023 | 19. | 0.413 |
| Selenium | 0.01 | 0.116 | <0.00038 | 0.0025 | 0.685 | 0.05 |
| **Radiological (pCi/L)** | | | | | | |
| Net Alpha (Gross Alpha excluding radon and uranium)[g] | 15 | 0[h] | 0[h] | 71.02 | 1,073.14 | 620.52 |
| Radium-226+228 | 5.0 | 0.16 | <0.81 | 1 | 36 | 2.70 |
| Uranium-234+238[i] | 30.0 | 391.19 | 110.04 | 22.77 | 6,039 | 1,006.5 |

[a]Standards from the Uranium Mill Tailings Radiation Control Act, revised in 1986.
[b]CDPHE Water Quality Control Division, Regulation No. 41, Basic Standards for Ground Water, effective March 2, 1999. Standards in the "Potentially Usable Quality" classification were used for GJO ground water.
[c]"<" indicates that the maximum concentration was below the detection limit (number shown is detection limit).
[d]Based on maximum concentrations observed from 1984 through 2001.
[e] Nitrate standard "as N" (and some measured values) was converted to nitrate using the conversion $NO_3$ = N x 4.427.
[f]This is a site-specific standard calculated as background x 1.25. The background value is based an average of the 1991-1999 sampling events.
[g]Net alpha values represent gross alpha minus uranium activity. Uranium concentrations that were measured in grams were converted to pCi/L. The conversion assumes equilibrium and an activity of 0.687 pCi/μg
[h]Uranium value greater than gross alpha value.
[i]Uranium concentrations measured in mg/L were converted to uranium-234+238 activity using a conversion factor of 671 pCi/mg.

Analytical results of samples collected from ground water monitoring wells in 2002 are presented in Appendix A. These tables contain analytical results for several constituents that are not presented in Table 6–2 because either no ground water quality standard currently exists for these constituents or the measured concentration was below applicable State standards.

To date, 23 ground water sampling events have been conducted since remediation of open-land areas was completed. Time-concentration plots in Appendix B, as well as a statistical study of uranium and molybdenum values from well GJ84–04, indicate aquifer cleanup is progressing.

### 6.3.1 Radiological Ground Water Sampling Results

Uranium contamination is widespread throughout the alluvial aquifer beneath the facility. Uranium concentrations above the UMTRCA standard of 30 pCi/L (combined uranium-234 and uranium-238 activity; approximately equal to 0.044 mg/L) were recorded in samples from all alluvial wells analyzed for uranium during 2002 (8 of 8 wells) (Appendix A and Appendix B). No background wells were sampled in 2002. The highest uranium concentration measured in 2002, 400.52 pCi/L (0.583 mg/L), was measured in a sample from on-site well 8–4S, located near the dike in the southern portion of the facility. This highest uranium concentration measured in 2002 is significantly below concentrations observed prior to soils remediation of the GJO facility (Table 6−2), which is another indication that aquifer cleanup is progressing.

Gross alpha concentrations exceeding the UMTRCA net alpha standard of 15 pCi/L have been measured in on-site wells and reported in previous Site Environmental Reports. In 2002, the standard was not exceeded in any ground water samples collected. Although all gross alpha concentrations measured in the ground water were greater than 15 pCi/L (maximum of 379.94 pCi/L in well 8-4S), the net alpha standard, which excludes radon and uranium, was not exceeded.

Historically, radium-226 contamination appeared to be localized in areas of buried tailings, which are now remediated. In 2002, all radium-226 and radium-228 concentrations in samples collected from the alluvial aquifer were near or below the detection limit, and the radium-226 + radium-228 ground water standard of 5 pCi/L was not exceeded.

### 6.3.2 Nonradiological Ground Water Sampling Results

As with uranium, molybdenum contamination is also widespread in the alluvial aquifer. Samples from three of seven on-site wells (8−4S, GJ01-01, and 14−13NA) and the single downgradient well (GJ84−04) sampled in 2002 contained concentrations of molybdenum in excess of the UMTRCA ground water standard of 0.1 mg/L (Table 6−1). The highest concentration (0.256 mg/L) was measured in a sample from on-site well 8−4S. Generally, molybdenum concentrations with respect to time in the alluvial aquifer are decreasing. Wells 11-1S, 10-19N, and 6-2N have historically had molybdenum concentrations above the standard; however, molybdenum concentrations measured in samples collected from these wells in recent years have been consistently below the standard. In addition, downgradient well GJ84-04 has shown a consistent decline in molybdenum concentrations, and the concentration from this sampling event (0.111 mg/L) is just above the standard of 0.10 mg/L. One exception to the trend of decreasing concentrations is well 14-13NA, which has had consistent molybdenum concentrations above the standard since surface remediation was completed. Time-concentration graphs of molybdenum in wells 10-19N, 11-1S, 14-13NA, 6-2N, 804S, and GJ84-04 are illustrated in Appendix B.

Arsenic contamination is localized in the area formerly occupied by a large tailings pile, and arsenic concentrations exceeding the UMTRCA/State standard of 0.05 mg/L have been recorded in samples from on-site wells in previous Site Environmental Reports. None of the eight wells sampled during 2002 had arsenic concentrations that exceeded this standard. Historical data for this analyte in the alluvial aquifer is provided in previous Site Environmental Reports.

Selenium concentrations exceeded the UMTRCA standard of 0.01 mg/L in samples from three of seven on-site wells in 2002 (Table 6−1). The highest selenium concentration, 0.116 mg/L, was detected in a sample from on-site well 6–2N. A sample from this well also yielded the highest selenium concentration in 2001. As with molybdenum, selenium concentrations in the alluvial aquifer are generally decreasing. Wells 14-13NA, 11-1S, 10-19N, and GJ84-04 had historical selenium concentrations that exceeded the selenium standard of 0.01mg/L; however, in recent years, selenium concentrations measured in samples collected from these wells have been consistently below the standard. Selenium concentrations in samples collected from well 8-4S have been consistently above the standard in recent years, but current concentrations are an order of magnitude lower than the concentrations measured prior to and during soil remediation at the GJO.

Nitrate concentrations did not exceed the UMTRCA and State ground water standard of 44.27 mg/L (as nitrate) in ground water samples collected in 2002. The maximum nitrate concentration of 37.6 mg/L was measured in a sample from on-site well GJ01-01. Nitrate concentrations measured in the alluvial aquifer have not exceeded the standard since 2000.

In 2002, concentrations of total dissolved solids exceeded the aquifer-specific State standard of 2,210 mg/L (1.25 times background) in samples from three of seven on-site wells (10−19N, 14−13NA, and 6−2N) and the one downgradient well (GJ84−04) (Table 6−1). The highest dissolved solids concentration recorded in 2002 (4,480 mg/L) occurred in a sample from on-site well 10–19N.

End of current text

# 7.0 Quality Assurance

*WASTREN, Inc*., and MACTEC−ERS, the GJO contractors prior to July 22, 2002, used a joint quality assurance (QA) program that adopted the requirements and philosophy of DOE Order 5700.6C, *Quality Assurance*. The QA Program provided a structured approach for the application of QA principles to work performed for DOE and was implemented through the *GJO Quality Assurance Manual* (GJO 1). The Technical Assistance Contractor (TAC), Stoller GJO, issued a revised version of the document August 12, 2002. The *GJO Quality Assurance Manual* (GJO 1) includes the requirements of DOE Order 414.1A, *Quality Assurance,* and refers to documents that implement the QA Program.

A Quality Assurance Program Plan (QAPP), developed for specific environmental monitoring and surveillance needs at the GJO, is appended to the *Environmental Monitoring Plan* (DOE 2001b). The primary purposes of the QAPP are to ensure that environmental data are valid and traceable and that they fulfill the requirements of the QA program.

## 7.1 Sampling

Strategies and objectives for effluent monitoring and environmental sampling at the GJO are described in the *Environmental Monitoring Plan* (DOE 2001b). Procedures addressing field quality control, sampling methods, sample identification, chain-of-custody, equipment calibration, and independent data verification are addressed by the organizations responsible for the work performed.

## 7.2 Laboratory Analysis

The GJO Analytical Laboratory performs analyses in support of GJO environmental monitoring programs and implements QA requirements through their QA plan as documented in the *Analytical Chemistry Laboratory Administrative Plan and Quality Control Procedures* (Lab−5). The laboratory's objective is to provide high-quality analytical data that meet environmental monitoring program requirements. This objective is met by implementation of a documented QA plan, technically competent staff, suitable facilities and equipment, and written procedures. The QA plan is routinely reviewed for adequacy and effectiveness and revised as needed. QA staff frequently evaluates the effectiveness of the of the Laboratory QA program.

The *Analytical Chemistry Laboratory Handbook of Analytical and Sample-Preparation Procedures,* (LAB-1 through 4) defines and assigns responsibility for the following quality-related items:

- Internal review of laboratory operations (technical methods, written procedures, quality control and sample data, final data reports, logbooks, Laboratory Information Management System [LIMS], etc).
- Coordination and follow-up of external reviews.
- Nonconformance identification and reporting.
- Corrective action implementation and tracking.
- Periodic quality reports to laboratory management.
- Maintenance of laboratory certifications, accreditations, and proficiency testing programs.
- Document and record control.

- Monitoring of laboratory Quality Control and establishing acceptance criteria.
- Statistical quality control program to evaluate process capabilities, characterize reference materials, reduce process variation, and streamline processes.
- Calibration of measuring and test equipment.
- Control of chemical standards and reagents.
- Formal training and qualification of laboratory employees.
- Software QA program.
- Program for procurement of materials and services.
- Control of laboratory access.
- Coordination with the Technical Assistance Contractor QA Manager to ensure compliance with the contractor QA Program.

In support of work for the DOE, the laboratory maintains approval with the DOE Environmental Management Consolidated Audit Program, certification with the State of Utah in accord with the 2000 National Environmental Laboratory Accreditation Conference Standard, and accreditation with the American Industrial Hygiene Association in the Industrial Hygiene Program for metals, inorganic acids, asbestos (both respirable and bulk), and gravimetric methods. The laboratory participates in the following proficiency testing programs required to maintain these endorsements:

- Environmental Measurements Laboratory Quality Assessment Program
- Mixed Analyte Performance Evaluation Program
- Proficiency Testing Program for Airborne Contaminants
- Proficiency Testing Program for Bulk Asbestos
- Proficiency Testing Program–Absolute Standards
- Proficiency Testing Program–Environmental Resource Associates

## 7.3 Data and Records Management

Records are created both on paper and electronically in a retrievable format. They are protected against deterioration, damage, and loss. Records generated in support of environmental monitoring are subject to the requirements of 36 CFR 1220−1234. The *GJO Records Management Manual* (GJO 9), guidance in the Environmental Monitoring Plan (DOE 2001b), and the Environmental Services working file index implement applicable records regulations.

Laboratory analytical results of environmental samples are received electronically into an Oracle database. These data are maintained, protected, and archived by the GJO Information Management group.

# 8.0 References


2 CCR 402−2, Colorado Department of Natural Resources, Division of Water Resources, "Water Well Construction" *Colorado Code of Regulations.*

5 CCR 1002−31, Colorado Department of Public Health and Environment, "Basic Standards and Methodologies for Surface Water," *Colorado Code of Regulations*.

5 CCR 1002−35, Colorado Department of Public Health and Environment, "Classification and Numeric Standards for Gunnison and Lower Dolores River Basins," *Colorado Code of Regulations*.

36 CFR Part 1220, "Federal Records; General", and Part 1234, "Electronic Records Management", National Archives and Records Administration, *Code of Federal Regulations*.

40 CFR 61, U.S. Environmental Protection Agency, "National Emission Standards for Hazardous Air Pollutants," *Code of Federal Regulations*.

40 CFR 192, U.S. Environmental Protection Agency, "Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings," *Code of Federal Regulations*.

Allen, J.R.L., 1970. *Physical Processes of Sedimentation,* American Elsevier Publishing Company, New York City.

Executive Order 11990, "Protection of Wetlands," 1977.

Executive Order 12856, "Federal Compliance with Right-to-Know Laws and Pollution Prevention Requirements," 1993.

Executive Order 13148 "Greening of the Government Through Leadership in Environmental Management."

Henwood, P., and C. Ridolfi, 1986. *Radiologic Characterization of the U.S. Department of Energy Grand Junction Projects Office Facility*, GJ−41, Bendix Field Engineering Corporation, prepared for the U.S. Department of Energy, Grand Junction Office, Grand Junction, Colorado.

Schweigert, K.P., 1999. *Historic Structures Survey of the Department of Energy Grand Junction Office, Final Report*, prepared for DOE−GJO, Grand Junction, Colorado by Kurt P. Schweigert, M.A., Associated Cultural Resource Experts, Englewood, Colorado, October.

Tonello, D., 2001. *E-mail correspondence from the City of Grand Junction's Industrial Pretreatment Program acknowledging DOE/GJO's compliance with all wastewater limitations contained in the City's Code of Ordinances regarding effluent discharges to the sanitary sewer system* from Dan Tonello with the City of Grand Junction to Larry Arnold with the DOE/GJO.

U.S. Department of Energy (DOE), 1989. *Final Remedial Investigation/Feasibility Study−Environmental Assessment for the U.S. Department of Energy Grand Junction (Colorado) Projects Office Facility*, DOE/EA−0402, prepared by UNC Geotech, Inc., for U.S. Department of Energy, U.S. Department of Energy Grand Junction Projects Office, Grand Junction, Colorado, July.

———, 1990. *Grand Junction Projects Office Remedial Action Project Declaration for the Record of Decision and Record of Decision Summary*, U.S. Department of Energy, Idaho Operations Office, Grand Junction Projects Office, Grand Junction, Colorado.

———, 1996. *Environmental Assessment of Facility Operations at the U.S. Department of Energy Grand Junction Projects Office, Grand Junction, Colorado*, prepared by Rust Geotech for the U.S. Department of Energy Grand Junction Projects Office, Grand Junction, Colorado.

———, 2000a. *Request for Deferred Remediation at the U.S. Department of Energy, Grand Junction Office*, prepared by the U.S. Department of Energy Grand Junction Office, Grand Junction, Colorado.

———, 2000b. *Environmental Assessment for the Transfer of the U.S. Department of Energy Grand Junction Office to Non-DOE Ownership*, prepared by *TetraTech* for the U.S. Department of Energy Grand Junction Office, Grand Junction, Colorado.

———, 2001a. *U.S. Department of Energy, Grand Junction Office letter to the City of Grand Junction's Industrial Pretreatment Program regarding concurrence that effluent discharges meet current local limits contained in the Grand Junction Code, Section 38-49*, sent to Dan Tonello with the City of Grand Junction by Larry Arnold with the U.S. Department of Energy Grand Junction Office, Grand Junction, Colorado.

———, 2001b. *Grand Junction Projects Office Facility Site Environmental Monitoring Plan,* prepared by *WASTREN, Inc.*, for the U.S. Department of Energy Grand Junction Office, Grand Junction, Colorado.

———, 2001c. *Sampling and Analysis Plan for the UMTRA Ground Water Project,* MAC-GWADM 19.1-1, Rev. 5, prepared by the U.S. Department of Energy Grand Junction Office, Grand Junction, Colorado

———, [current version]. *Analytical Chemistry Laboratory Handbook of Analytical Sample-Preparation Procedures,* LAB-1 through 4, prepared by Teledyne Brown for the U.S. Department of Energy Grand Junction Office, Grand Junction, Colorado.

———, [current version]. *Analytical Chemistry Laboratory Administrative Plan and Quality Control Procedures,* LAB-5, prepared by Teledyne Brown for the U.S. Department of Energy Grand Junction Office, Grand Junction, Colorado.

———, [current version]. *Grand Junction Office Health and Safety Manual*, GJO 2, prepared by S. M. Stoller for the U.S. Department of Energy Grand Junction Office, Grand Junction, Colorado.

U.S. Department of Energy (DOE), [current version]. *Grand Junction Office Integrated Safety Management System Description*, GJO 10, prepared by S. M. Stoller for the U.S. Department of Energy Grand Junction Office, Grand Junction, Colorado.

———, [current version]. *Grand Junction Office Site Radiological Control Manual*, GJO 3, prepared by S. M. Stoller for the U.S. Department of Energy Grand Junction Office, Grand Junction, Colorado.

———, [current version]. *Grand Junction Office Records Management Manual*, GJO 9, prepared by S. M. Stoller for the U.S. Department of Energy Grand Junction Office, Grand Junction, Colorado.

———, [current version]. *Grand Junction Office Quality Assurance Manual*, GJO 1, prepared by S. M. Stoller for the U.S. Department of Energy Grand Junction Office, Grand Junction, Colorado.

DOE Order 231.1, *Environment, Safety, and Health Reporting*.

DOE Order 414.1A with Change 1, *Quality Assurance*.

DOE Order 435.1, *Radioactive Waste Management*

DOE Order 5400.5, *Radiation Protection of the Public and the Environment*.

DOE Order 5700.6C, *Quality Assurance*.

U.S. Environmental Protection Agency (EPA), 1989. *A Guide for Determining Compliance with the Clean Air Act Standards for Radionuclide Emissions*

U.S. Geological Survey, 1962 (photo revised 1973). Grand Junction, Colorado, 7.5-minute topographic map. Scale 1:24,000.

End of current text

# Appendix A

# Surface and Ground Water Monitoring Data

SURFACE WATER QUALITY DATA BY PARAMETER (USEE800) FOR SITE GJO01, GRAND JUNCTION OFFICE (GJO)
REPORT DATE: 6/9/2003 8:49 am

| PARAMETER | UNITS | LOCATION ID | SAMPLE: DATE | ID | RESULT | QUALIFIERS: LAB | DATA | QA | DETECTION LIMIT | UN-CERTAINTY |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Total (As CaCO3 | mg/L | Lower Gunnison | 01/11/2002 | 0001 | 85 | | | # | - | - |
| | mg/L | North Pond | 01/09/2002 | 0001 | 150 | | | # | - | - |
| | mg/L | South Pond | 01/08/2002 | 0001 | 18 | | | # | - | - |
| | mg/L | Upper Mid Gunnison | 01/09/2002 | 0001 | 140 | | | # | - | - |
| | mg/L | Wetland Area | 01/09/2002 | 0001 | 161 | | | # | - | - |
| | mg/L | WW-1 | 01/09/2002 | 0001 | 82 | | | # | - | - |
| | mg/L | WW-2 | 01/09/2002 | 0001 | 150 | | | # | - | - |
| | mg/L | WW-3 | 01/09/2002 | 0001 | 53 | | | # | - | - |
| Ammonia Total as NH4 | mg/L | Lower Gunnison | 01/11/2002 | 0001 | 0.0277 B | | U | # | 0.0042 | - |
| | mg/L | North Pond | 01/09/2002 | 0001 | 0.0777 B | | | # | 0.0042 | - |
| | mg/L | South Pond | 01/08/2002 | 0001 | 0.0854 B | | | # | 0.0042 | - |
| | mg/L | Upper Mid Gunnison | 01/09/2002 | 0001 | 0.0174 B | | U | # | 0.0042 | - |
| | mg/L | Upper Mid Gunnison | 01/09/2002 | 0002 | 0.0289 B | | U | # | 0.0042 | - |
| | mg/L | Wetland Area | 01/09/2002 | 0001 | 0.227 | | | # | 0.0042 | - |
| | mg/L | WW-1 | 01/09/2002 | 0001 | 0.0983 B | | | # | 0.0042 | - |
| | mg/L | WW-2 | 01/09/2002 | 0001 | 0.161 | | | # | 0.0042 | - |
| | mg/L | WW-3 | 01/09/2002 | 0001 | 0.130 | | | # | 0.0042 | - |
| Arsenic | mg/L | Lower Gunnison | 01/11/2002 | 0001 | 0.0006 U | | | # | 0.0006 | - |
| | mg/L | North Pond | 01/09/2002 | 0001 | 0.005 B | | | # | 0.0006 | - |
| | mg/L | South Pond | 01/08/2002 | 0001 | 0.0085 | | | # | 0.0006 | - |
| | mg/L | Upper Mid Gunnison | 01/09/2002 | 0001 | 0.0006 B | | | # | 0.0006 | - |

SURFACE WATER QUALITY DATA BY PARAMETER (USEE800) FOR SITE GJO01, GRAND JUNCTION OFFICE (GJO)
REPORT DATE: 6/9/2003 8:49 am

| PARAMETER | UNITS | LOCATION ID | SAMPLE: DATE | ID | RESULT | QUALIFIERS: LAB | DATA | QA | DETECTION LIMIT | UN-CERTAINTY |
|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | mg/L | Upper Mid Gunnison | 01/09/2002 | 0002 | 0.0009 | | B | # | 0.0006 | - |
| | mg/L | Wetland Area | 01/09/2002 | 0001 | 0.0029 | | B | # | 0.0006 | - |
| | mg/L | WW-1 | 01/09/2002 | 0001 | 0.0026 | | B | # | 0.0006 | - |
| | mg/L | WW-2 | 01/09/2002 | 0001 | 0.0038 | | B | # | 0.0006 | - |
| | mg/L | WW-3 | 01/09/2002 | 0001 | 0.0013 | | B | # | 0.0006 | - |
| Chloride | mg/L | Lower Gunnison | 01/11/2002 | 0001 | 16.700 | | | # | 0.374 | - |
| | mg/L | North Pond | 01/09/2002 | 0001 | 775.000 | | | # | 3.74 | - |
| | mg/L | South Pond | 01/08/2002 | 0001 | 122.000 | | | # | 0.748 | - |
| | mg/L | Upper Mid Gunnison | 01/09/2002 | 0001 | 7.340 | | | # | 0.187 | - |
| | mg/L | Upper Mid Gunnison | 01/09/2002 | 0002 | 7.770 | | | # | 0.187 | - |
| | mg/L | Wetland Area | 01/09/2002 | 0001 | 1800.000 | | | # | 7.48 | - |
| | mg/L | WW-1 | 01/09/2002 | 0001 | 459.000 | | | # | 1.87 | - |
| | mg/L | WW-2 | 01/09/2002 | 0001 | 2200.000 | | | # | 7.48 | - |
| | mg/L | WW-3 | 01/09/2002 | 0001 | 1010.000 | | | # | 3.74 | - |
| Chromium | mg/L | Lower Gunnison | 01/11/2002 | 0001 | 0.0008 | | U | # | 0.0008 | - |
| | mg/L | North Pond | 01/09/2002 | 0001 | 0.0008 | | U | # | 0.0008 | - |
| | mg/L | South Pond | 01/08/2002 | 0001 | 0.0008 | | U | # | 0.0008 | - |
| | mg/L | Upper Mid Gunnison | 01/09/2002 | 0001 | 0.0008 | | U | # | 0.0008 | - |
| | mg/L | Upper Mid Gunnison | 01/09/2002 | 0002 | 0.0008 | | U | # | 0.0008 | - |
| | mg/L | Wetland Area | 01/09/2002 | 0001 | 0.0008 | | U | # | 0.0008 | - |
| | mg/L | WW-1 | 01/09/2002 | 0001 | 0.0008 | | U | # | 0.0008 | - |
| | mg/L | WW-2 | 01/09/2002 | 0001 | 0.0008 | | U | # | 0.0008 | - |

SURFACE WATER QUALITY DATA BY PARAMETER (USEE800) FOR SITE GJO01, GRAND JUNCTION OFFICE (GJO)
REPORT DATE: 6/9/2003 8:49 am

| PARAMETER | UNITS | LOCATION ID | SAMPLE: DATE | ID | RESULT | QUALIFIERS: LAB | DATA | QA | DETECTION LIMIT | UN-CERTAINTY |
|---|---|---|---|---|---|---|---|---|---|---|
| Chromium | mg/L | WW-3 | 01/09/2002 | 0001 | 0.0008 | U | | # | 0.0008 | - |
| Dissolved Oxygen | mg/L | Lower Gunnison | 01/11/2002 | N001 | 12.34 | | | # | - | - |
| | mg/L | North Pond | 01/09/2002 | N001 | 10.26 | | | # | - | - |
| | mg/L | South Pond | 01/08/2002 | N001 | 7.97 | | | # | - | - |
| | mg/L | Upper Mid Gunnison | 01/09/2002 | N001 | 12.56 | | | # | - | - |
| | mg/L | Wetland Area | 01/09/2002 | N001 | 16.55 | | | # | - | - |
| | mg/L | WW-1 | 01/09/2002 | N001 | 7.68 | | | # | - | - |
| | mg/L | WW-2 | 01/09/2002 | N001 | 14.67 | | | # | - | - |
| | mg/L | WW-3 | 01/09/2002 | N001 | 11.78 | | | # | - | - |
| Gross Alpha | pCi/L | Lower Gunnison | 01/11/2002 | 0001 | 9.94 | | | # | 6.84 | ± 4.92 |
| | pCi/L | North Pond | 01/09/2002 | 0001 | 153.07 | | | # | 56.32 | ± 44.8 |
| | pCi/L | South Pond | 01/08/2002 | 0001 | 132.4 | | | # | 21.28 | ± 24.7 |
| | pCi/L | Upper Mid Gunnison | 01/09/2002 | 0001 | 6.3 | U | | # | 6.3 | ± 3.95 |
| | pCi/L | Upper Mid Gunnison | 01/09/2002 | 0002 | 6.33 | U | | # | 6.33 | ± 3.48 |
| | pCi/L | Wetland Area | 01/09/2002 | 0001 | 865.82 | | | # | 216.35 | ± 193. |
| | pCi/L | WW-1 | 01/09/2002 | 0001 | 505.74 | | | # | 75.13 | ± 81.6 |
| | pCi/L | WW-2 | 01/09/2002 | 0001 | 1210.73 | | | # | 227.69 | ± 225. |
| | pCi/L | WW-3 | 01/09/2002 | 0001 | 317.41 | | | # | 93.22 | ± 79.3 |
| Gross Beta | pCi/L | Lower Gunnison | 01/11/2002 | 0001 | 5.77 | UB | | # | 5.77 | ± 3.53 |
| | pCi/L | North Pond | 01/09/2002 | 0001 | 66.65 | U | | # | 66.65 | ± 40.5 |
| | pCi/L | South Pond | 01/08/2002 | 0001 | 53.34 | B | | # | 19.76 | ± 14.0 |
| | pCi/L | Upper Mid Gunnison | 01/09/2002 | 0001 | 5.72 | UB | | # | 5.72 | ± 3.49 |

SURFACE WATER QUALITY DATA BY PARAMETER (USEE800) FOR SITE GJO01, GRAND JUNCTION OFFICE (GJO)
REPORT DATE: 6/9/2003 8:49 am

| PARAMETER | UNITS | LOCATION ID | SAMPLE: DATE | ID | RESULT | QUALIFIERS: LAB | DATA | QA | DETECTION LIMIT | UN-CERTAINTY |
|---|---|---|---|---|---|---|---|---|---|---|
| Gross Beta | pCi/L | Upper Mid Gunnison | 01/09/2002 | 0002 | 7.22 | B | | # | 5.7 | ± 3.64 |
| | pCi/L | Wetland Area | 01/09/2002 | 0001 | 417.17 | | | # | 202.36 | ± 133. |
| | pCi/L | WW-1 | 01/09/2002 | 0001 | 177.95 | | | # | 68.33 | ± 46.3 |
| | pCi/L | WW-2 | 01/09/2002 | 0001 | 589.02 | | | # | 203.83 | ± 140. |
| | pCi/L | WW-3 | 01/09/2002 | 0001 | 153.62 | | | # | 100.51 | ± 64.0 |
| Manganese | mg/L | Lower Gunnison | 01/11/2002 | 0001 | 0.100 | | | # | 0.0001 | - |
| | mg/L | North Pond | 01/09/2002 | 0001 | 0.0358 | | | # | 0.0001 | - |
| | mg/L | South Pond | 01/08/2002 | 0001 | 0.0352 | | | # | 0.0001 | - |
| | mg/L | Upper Mid Gunnison | 01/09/2002 | 0001 | 0.0324 | | | # | 0.0001 | - |
| | mg/L | Upper Mid Gunnison | 01/09/2002 | 0002 | 0.0314 | | | # | 0.0001 | - |
| | mg/L | Wetland Area | 01/09/2002 | 0001 | 0.0923 | | | # | 0.0001 | - |
| | mg/L | WW-1 | 01/09/2002 | 0001 | 0.0533 | | | # | 0.0001 | - |
| | mg/L | WW-2 | 01/09/2002 | 0001 | 0.0966 | | | # | 0.0001 | - |
| | mg/L | WW-3 | 01/09/2002 | 0001 | 0.0127 | | | # | 0.0001 | - |
| Molybdenum | mg/L | Lower Gunnison | 01/11/2002 | 0001 | 0.0015 | U | | # | 0.0015 | - |
| | mg/L | North Pond | 01/09/2002 | 0001 | 0.0081 | B | | # | 0.0015 | - |
| | mg/L | South Pond | 01/08/2002 | 0001 | 0.0791 | | | # | 0.0015 | - |
| | mg/L | Upper Mid Gunnison | 01/09/2002 | 0001 | 0.0015 | U | | # | 0.0015 | - |
| | mg/L | Upper Mid Gunnison | 01/09/2002 | 0002 | 0.0015 | U | | # | 0.0015 | - |
| | mg/L | Wetland Area | 01/09/2002 | 0001 | 0.505 | | | # | 0.0015 | - |
| | mg/L | WW-1 | 01/09/2002 | 0001 | 0.411 | | | # | 0.0015 | - |
| | mg/L | WW-2 | 01/09/2002 | 0001 | 1.070 | | | # | 0.0015 | - |

| PARAMETER | UNITS | LOCATION ID | SAMPLE: DATE | ID | RESULT | QUALIFIERS: LAB | DATA | QA | DETECTION LIMIT | UN-CERTAINTY |
|---|---|---|---|---|---|---|---|---|---|---|
| Molybdenum | mg/L | WW-3 | 01/09/2002 | 0001 | 0.506 | | | # | 0.0015 | - |
| Nitrate as NO3 | mg/L | Lower Gunnison | 01/11/2002 | 0001 | 5.620 | | | # | 0.0305 | - |
| | mg/L | North Pond | 01/09/2002 | 0001 | 0.591 | B | | # | 0.0305 | - |
| | mg/L | South Pond | 01/08/2002 | 0001 | 1.070 | | | # | 0.0305 | - |
| | mg/L | Upper Mid Gunnison | 01/09/2002 | 0001 | 4.610 | | | # | 0.0305 | - |
| | mg/L | Upper Mid Gunnison | 01/09/2002 | 0002 | 4.810 | | | # | 0.0305 | - |
| | mg/L | Wetland Area | 01/09/2002 | 0001 | 0.541 | B | | # | 0.0305 | - |
| | mg/L | WW-1 | 01/09/2002 | 0001 | 0.665 | B | | # | 0.0305 | - |
| | mg/L | WW-2 | 01/09/2002 | 0001 | 0.460 | B | | # | 0.0305 | - |
| | mg/L | WW-3 | 01/09/2002 | 0001 | 0.811 | B | | # | 0.0305 | - |
| ORP of Zobell Solution | mV | North Pond | 01/09/2002 | N001 | 215 | | | # | - | - |
| | mV | Upper Mid Gunnison | 01/09/2002 | N001 | 215 | | | # | - | - |
| | mV | Wetland Area | 01/09/2002 | N001 | 215 | | | # | - | - |
| | mV | WW-1 | 01/09/2002 | N001 | 215 | | | # | - | - |
| | mV | WW-2 | 01/09/2002 | N001 | 215 | | | # | - | - |
| | mV | WW-3 | 01/09/2002 | N001 | 215 | | | # | - | - |
| Oxidation Reduction Potent | mV | Lower Gunnison | 01/11/2002 | N001 | 154 | | | # | - | - |
| | mV | North Pond | 01/09/2002 | N001 | 177.7 | | | # | - | - |
| | mV | South Pond | 01/08/2002 | N001 | 131 | | | # | - | - |
| | mV | Upper Mid Gunnison | 01/09/2002 | N001 | 152 | | | # | - | - |
| | mV | Wetland Area | 01/09/2002 | N001 | 105 | | | # | - | - |
| | mV | WW-1 | 01/09/2002 | N001 | 85.3 | | | # | - | - |
| | mV | WW-2 | 01/09/2002 | N001 | 101 | | | # | - | - |

SURFACE WATER QUALITY DATA BY PARAMETER (USEE800) FOR SITE GJO01, GRAND JUNCTION OFFICE (GJO)
REPORT DATE: 6/9/2003 8:49 am

| PARAMETER | UNITS | LOCATION ID | SAMPLE: DATE | ID | RESULT | QUALIFIERS: LAB | DATA | QA | DETECTION LIMIT | UN-CERTAINTY |
|---|---|---|---|---|---|---|---|---|---|---|
| Oxidation Reduction Potent | mV | WW-3 | 01/09/2002 | N001 | 143 | | | # | - | - |
| pH | s.u. | Lower Gunnison | 01/11/2002 | N001 | 8.14 | | | # | - | - |
| | s.u. | North Pond | 01/09/2002 | N001 | 8.35 | | | # | - | - |
| | s.u. | South Pond | 01/08/2002 | N001 | 7.6 | | | # | - | - |
| | s.u. | Upper Mid Gunnison | 01/09/2002 | N001 | 8.47 | | | # | - | - |
| | s.u. | Wetland Area | 01/09/2002 | N001 | 9.1 | | | # | - | - |
| | s.u. | WW-1 | 01/09/2002 | N001 | 8.51 | | | # | - | - |
| | s.u. | WW-2 | 01/09/2002 | N001 | 9.18 | | | # | - | - |
| | s.u. | WW-3 | 01/09/2002 | N001 | 8.82 | | | # | - | - |
| Radium-226 | pCi/L | Lower Gunnison | 01/11/2002 | 0001 | 0.13 | | | # | 0.08 | ± 0.05 |
| | pCi/L | North Pond | 01/09/2002 | 0001 | 0.08 | U | | # | 0.08 | ± 0.05 |
| | pCi/L | South Pond | 01/08/2002 | 0001 | 0.16 | | | # | 0.11 | ± 0.07 |
| | pCi/L | Upper Mid Gunnison | 01/09/2002 | 0001 | 0.11 | | | # | 0.08 | ± 0.05 |
| | pCi/L | Upper Mid Gunnison | 01/09/2002 | 0002 | 0.11 | | | # | 0.08 | ± 0.05 |
| | pCi/L | Wetland Area | 01/09/2002 | 0001 | 0.2 | | | # | 0.12 | ± 0.08 |
| | pCi/L | WW-1 | 01/09/2002 | 0001 | 0.08 | U | | # | 0.08 | ± 0.04 |
| | pCi/L | WW-2 | 01/09/2002 | 0001 | 0.11 | | | # | 0.1 | ± 0.07 |
| | pCi/L | WW-3 | 01/09/2002 | 0001 | 0.11 | U | | # | 0.11 | ± 0.07 |
| Radium-228 | pCi/L | Lower Gunnison | 01/11/2002 | 0001 | 0.75 | U | | # | 0.75 | ± 0.44 |
| | pCi/L | North Pond | 01/09/2002 | 0001 | 0.77 | U | | # | 0.77 | ± 0.46 |
| | pCi/L | South Pond | 01/08/2002 | 0001 | 0.99 | U | | # | 0.99 | ± 0.59 |
| | pCi/L | Upper Mid Gunnison | 01/09/2002 | 0001 | 0.73 | U | | # | 0.73 | ± 0.43 |

| PARAMETER | UNITS | LOCATION ID | SAMPLE: DATE | ID | RESULT | QUALIFIERS: LAB | DATA | QA | DETECTION LIMIT | UN-CERTAINTY |
|---|---|---|---|---|---|---|---|---|---|---|
| Radium-228 | pCi/L | Upper Mid Gunnison | 01/09/2002 | 0002 | 0.71 | U | | # | 0.71 | ± 0.42 |
| | pCi/L | Wetland Area | 01/09/2002 | 0001 | 0.94 | U | | # | 0.94 | ± 0.55 |
| | pCi/L | WW-1 | 01/09/2002 | 0001 | 0.67 | U | | # | 0.67 | ± 0.40 |
| | pCi/L | WW-2 | 01/09/2002 | 0001 | 0.92 | U | | # | 0.92 | ± 0.55 |
| | pCi/L | WW-3 | 01/09/2002 | 0001 | 0.98 | U | | # | 0.98 | ± 0.58 |
| Selenium | mg/L | Lower Gunnison | 01/11/2002 | 0001 | 0.0081 | | | # | 0.0003 | - |
| | mg/L | North Pond | 01/09/2002 | 0001 | 0.004 | B | | # | 0.0003 | - |
| | mg/L | South Pond | 01/08/2002 | 0001 | 0.0004 | B | | # | 0.0003 | - |
| | mg/L | Upper Mid Gunnison | 01/09/2002 | 0001 | 0.008 | | | # | 0.0003 | - |
| | mg/L | Upper Mid Gunnison | 01/09/2002 | 0002 | 0.0088 | | | # | 0.0003 | - |
| | mg/L | Wetland Area | 01/09/2002 | 0001 | 0.0016 | B | | # | 0.0003 | - |
| | mg/L | WW-1 | 01/09/2002 | 0001 | 0.0012 | B | U | # | 0.0003 | - |
| | mg/L | WW-2 | 01/09/2002 | 0001 | 0.0036 | B | | # | 0.0003 | - |
| | mg/L | WW-3 | 01/09/2002 | 0001 | 0.0023 | B | | # | 0.0003 | - |
| Specific Conductance | umhos/cm | Lower Gunnison | 01/11/2002 | N001 | 951 | | | # | - | - |
| | umhos/cm | North Pond | 01/09/2002 | N001 | 7024 | | | # | - | - |
| | umhos/cm | South Pond | 01/08/2002 | N001 | 2935 | | | # | - | - |
| | umhos/cm | Upper Mid Gunnison | 01/09/2002 | N001 | 900 | | | # | - | - |
| | umhos/cm | Wetland Area | 01/09/2002 | N001 | 32470 | | | # | - | - |
| | umhos/cm | WW-1 | 01/09/2002 | N001 | 8744 | | | # | - | - |
| | umhos/cm | WW-2 | 01/09/2002 | N001 | 33560 | | | # | - | - |
| | umhos/cm | WW-3 | 01/09/2002 | N001 | 13280 | | | # | - | - |

SURFACE WATER QUALITY DATA BY PARAMETER (USEE800) FOR SITE GJO01, GRAND JUNCTION OFFICE (GJO)
REPORT DATE: 6/9/2003 8:49 am

| PARAMETER | UNITS | LOCATION ID | SAMPLE: DATE | ID | RESULT | QUALIFIERS: LAB | DATA | QA | DETECTION LIMIT | UN-CERTAINTY |
|---|---|---|---|---|---|---|---|---|---|---|
| Sulfate | mg/L | Lower Gunnison | 01/11/2002 | 0001 | 398.000 | | | # | 0.41 | - |
| | mg/L | North Pond | 01/09/2002 | 0001 | 7300.000 | | | # | 4.1 | - |
| | mg/L | South Pond | 01/08/2002 | 0001 | 1430.000 | | | # | 0.82 | - |
| | mg/L | Upper Mid Gunnison | 01/09/2002 | 0001 | 330.000 | | | # | 0.205 | - |
| | mg/L | Upper Mid Gunnison | 01/09/2002 | 0002 | 330.000 | | | # | 0.205 | - |
| | mg/L | Wetland Area | 01/09/2002 | 0001 | 22000.000 | | | # | 20.5 | - |
| | mg/L | WW-1 | 01/09/2002 | 0001 | 3520.000 | | | # | 2.05 | - |
| | mg/L | WW-2 | 01/09/2002 | 0001 | 25500.000 | | | # | 16.4 | - |
| | mg/L | WW-3 | 01/09/2002 | 0001 | 11600.000 | | | # | 8.2 | - |
| Temperature | C | Lower Gunnison | 01/11/2002 | N001 | 2.22 | | | # | - | - |
| | C | North Pond | 01/09/2002 | N001 | 1.16 | | | # | - | - |
| | C | South Pond | 01/08/2002 | N001 | 4.61 | | | # | - | - |
| | C | Upper Mid Gunnison | 01/09/2002 | N001 | 4.76 | | | # | - | - |
| | C | Wetland Area | 01/09/2002 | N001 | 7.01 | | | # | - | - |
| | C | WW-1 | 01/09/2002 | N001 | 2.7 | | | # | - | - |
| | C | WW-2 | 01/09/2002 | N001 | 5.5 | | | # | - | - |
| | C | WW-3 | 01/09/2002 | N001 | 7 | | | # | - | - |
| Temperature of Zobell Solu | C | North Pond | 01/09/2002 | N001 | 15.6 | | | # | - | - |
| | C | Upper Mid Gunnison | 01/09/2002 | N001 | 15.6 | | | # | - | - |
| | C | Wetland Area | 01/09/2002 | N001 | 15.6 | | | # | - | - |
| | C | WW-1 | 01/09/2002 | N001 | 15.6 | | | # | - | - |
| | C | WW-2 | 01/09/2002 | N001 | 15.6 | | | # | - | - |
| | C | WW-3 | 01/09/2002 | N001 | 15.6 | | | # | - | - |

SURFACE WATER QUALITY DATA BY PARAMETER (USEE800) FOR SITE GJO01, GRAND JUNCTION OFFICE (GJO)
REPORT DATE: 6/9/2003 8:49 am

| PARAMETER | UNITS | LOCATION ID | SAMPLE: DATE | ID | RESULT | QUALIFIERS: LAB | DATA | QA | DETECTION LIMIT | UN-CERTAINTY |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids | mg/L | Lower Gunnison | 01/11/2002 | 0001 | 802 | | | # | 10 | - |
| | mg/L | North Pond | 01/09/2002 | 0001 | 12300 | | | # | 10 | - |
| | mg/L | South Pond | 01/08/2002 | 0001 | 2430 | | | # | 10 | - |
| | mg/L | Upper Mid Gunnison | 01/09/2002 | 0001 | 680 | | | # | 10 | - |
| | mg/L | Upper Mid Gunnison | 01/09/2002 | 0002 | 680 | | | # | 10 | - |
| | mg/L | Wetland Area | 01/09/2002 | 0001 | 35000 | | | # | 10 | - |
| | mg/L | WW-1 | 01/09/2002 | 0001 | 6090 | | | # | 10 | - |
| | mg/L | WW-2 | 01/09/2002 | 0001 | 38000 | | | # | 10 | - |
| | mg/L | WW-3 | 01/09/2002 | 0001 | 17800 | | | # | 10 | - |
| Turbidity | NTU | Lower Gunnison | 01/11/2002 | N001 | 11 | | | # | - | - |
| | NTU | North Pond | 01/09/2002 | N001 | 5.8 | | | # | - | - |
| | NTU | South Pond | 01/08/2002 | N001 | 2.4 | | | # | - | - |
| | NTU | Upper Mid Gunnison | 01/09/2002 | N001 | 23.6 | | | # | - | - |
| | NTU | Wetland Area | 01/09/2002 | N001 | 260 | | | # | - | - |
| | NTU | WW-1 | 01/09/2002 | N001 | 172 | | | # | - | - |
| | NTU | WW-2 | 01/09/2002 | N001 | 6.1 | | | # | - | - |
| | NTU | WW-3 | 01/09/2002 | N001 | 1.1 | | | # | - | - |
| Uranium | mg/L | Lower Gunnison | 01/11/2002 | 0001 | 0.014 | | | # | 0.0001 | - |
| | mg/L | North Pond | 01/09/2002 | 0001 | 0.285 | | | # | 0.0001 | - |
| | mg/L | South Pond | 01/08/2002 | 0001 | 0.268 | | | # | 0.0001 | - |
| | mg/L | Upper Mid Gunnison | 01/09/2002 | 0001 | 0.0082 | | | # | 0.0001 | - |

SURFACE WATER QUALITY DATA BY PARAMETER (USEE800) FOR SITE GJO01, GRAND JUNCTION OFFICE (GJO)
REPORT DATE: 6/9/2003 8:49 am

| PARAMETER | UNITS | LOCATION ID | SAMPLE: DATE | ID | RESULT | QUALIFIERS: LAB | DATA | QA | DETECTION LIMIT | UN-CERTAINTY |
|---|---|---|---|---|---|---|---|---|---|---|
| Uranium | mg/L | Upper Mid Gunnison | 01/09/2002 | 0002 | 0.0075 | | | # | 0.0001 | - |
| | mg/L | Wetland Area | 01/09/2002 | 0001 | 1.740 | | | # | 0.001 | - |
| | mg/L | WW-1 | 01/09/2002 | 0001 | 0.829 | | | # | 0.001 | - |
| | mg/L | WW-2 | 01/09/2002 | 0001 | 2.370 | | | # | 0.001 | - |
| | mg/L | WW-3 | 01/09/2002 | 0001 | 0.735 | | | # | 0.001 | - |
| Vanadium | mg/L | Lower Gunnison | 01/11/2002 | 0001 | 0.0006 | B | | # | 0.0004 | - |
| | mg/L | North Pond | 01/09/2002 | 0001 | 0.0095 | B | | # | 0.0004 | - |
| | mg/L | South Pond | 01/08/2002 | 0001 | 0.0019 | B | | # | 0.0004 | - |
| | mg/L | Upper Mid Gunnison | 01/09/2002 | 0001 | 0.0006 | B | | # | 0.0004 | - |
| | mg/L | Upper Mid Gunnison | 01/09/2002 | 0002 | 0.0005 | B | | # | 0.0004 | - |
| | mg/L | Wetland Area | 01/09/2002 | 0001 | 0.0038 | B | | # | 0.0004 | - |
| | mg/L | WW-1 | 01/09/2002 | 0001 | 0.0027 | B | | # | 0.0004 | - |
| | mg/L | WW-2 | 01/09/2002 | 0001 | 0.0028 | B | | # | 0.0004 | - |
| | mg/L | WW-3 | 01/09/2002 | 0001 | 0.0018 | B | | # | 0.0004 | - |

SURFACE WATER QUALITY DATA BY PARAMETER (USEE800) FOR SITE GJO01, GRAND JUNCTION OFFICE (GJO)
REPORT DATE: 6/9/2003 8:49 am

| PARAMETER | UNITS | LOCATION ID | SAMPLE: DATE | ID | RESULT | QUALIFIERS: LAB | DATA | QA | DETECTION LIMIT | UN-CERTAINTY |
|---|---|---|---|---|---|---|---|---|---|---|

RECORDS: SELECTED FROM USEE800 WHERE site_code='GJO01' AND quality_assurance = TRUE AND (data_validation_qualifiers IS NULL OR data_validation_qualifiers NOT LIKE '%R%' AND data_validation_qualifiers NOT LIKE '%X%' ) AND DATE_SAMPLED between #1/1/2002# and #1/31/2002#

SAMPLE ID CODES: 000X = Filtered sample (0.45 µm). N00X = Unfiltered sample. X = replicate number.

LAB QUALIFIERS:

| | |
|---|---|
| * | Replicate analysis not within control limits. |
| + | Correlation coefficient for MSA < 0.995. |
| > | Result above upper detection limit. |
| A | TIC is a suspected aldol-condensation product. |
| B | Inorganic: Result is between the IDL and CRDL. Organic: Analyte also found in method blank. |
| C | Pesticide result confirmed by GC-MS. |
| D | Analyte determined in diluted sample. |
| E | Inorganic: Estimate value because of interference, see case narrative. Organic: Analyte exceeded calibration range of the GC-MS. |
| H | Holding time expired, value suspect. |
| I | Increased detection limit due to required dilution. |
| J | Estimated |
| M | GFAA duplicate injection precision not met. |
| N | Inorganic or radiochemical: Spike sample recovery not within control limits. Organic: Tentatively identified compund (TIC). |
| P | > 25% difference in detected pesticide or Arochlor concentrations between 2 columns. |
| S | Result determined by method of standard addition (MSA). |
| U | Analytical result below detection limit. |
| W | Post-digestion spike outside control limits while sample absorbance < 50% of analytical spike absorbance. |
| X | Laboratory defined (USEPA CLP organic) qualifier, see case narrative. |
| Y | Laboratory defined (USEPA CLP organic) qualifier, see case narrative. |
| Z | Laboratory defined (USEPA CLP organic) qualifier, see case narrative. |

DATA QUALIFIERS:

| | |
|---|---|
| F | Low flow sampling method used. |
| J | Estimated value. |
| Q | Qualitative result due to sampling technique |
| U | Parameter analyzed for but was not detected. |
| G | Possible grout contamination, pH > 9. |
| L | Less than 3 bore volumes purged prior to sampling. |
| R | Unusable result. |
| X | Location is undefined. |

QA QUALIFIER: # = validated according to Quality Assurance guidelines.

CLASSIC GROUND WATER QUALITY DATA BY PARAMETER WITH ZONE (USEE201) FOR SITE GJO01, GRAND JUNCTION OFFICE (GJO)
REPORT DATE: 5/19/2003 9:37 am

| PARAMETER | UNITS | LOCATION ID | LOCATION TYPE | SAMPLE: DATE | ID | ZONE COMPL | FLOW REL. | RESULT | QUALIFIERS: LAB | DATA | QA | DETECTION LIMIT | UN-CERTAINTY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Total (As CaCO3 | mg/L | 10-19N | WL | 01/09/2002 | 0001 | | O | 352 | | F | # | - | - |
| | mg/L | 11-1S | WL | 01/08/2002 | 0001 | | O | 182 | | F | # | - | - |
| | mg/L | 14-13NA | WL | 01/09/2002 | 0001 | | O | 159 | | F | # | - | - |
| | mg/L | 6-2N | WL | 01/07/2002 | 0001 | | O | 230 | | F | # | - | - |
| | mg/L | 8-4S | WL | 01/07/2002 | 0001 | | O | 235 | | F | # | - | - |
| | mg/L | GJ01-01 | WL | 01/08/2002 | 0001 | AL | | 267 | | F | # | - | - |
| | mg/L | GJ01-02 | WL | 01/10/2002 | 0001 | AL | | 346 | | F | # | - | - |
| | mg/L | GJ84-04 | WL | 01/09/2002 | 0001 | | D | 143 | | F | # | - | - |
| Ammonia Total as NH4 | mg/L | 10-19N | WL | 01/09/2002 | 0001 | | O | 0.191 | | F | # | 0.0042 | - |
| | mg/L | 11-1S | WL | 01/08/2002 | 0001 | | O | 0.0059 | B | F | # | 0.0042 | - |
| | mg/L | 11-1S | WL | 01/08/2002 | 0002 | | O | 0.0087 | B | F | # | 0.0042 | - |
| | mg/L | 14-13NA | WL | 01/09/2002 | 0001 | | O | 1.510 | | F | # | 0.0042 | - |
| | mg/L | 6-2N | WL | 01/07/2002 | 0001 | | O | 0.0068 | B | F | # | 0.0042 | - |
| | mg/L | 8-4S | WL | 01/07/2002 | 0001 | | O | 0.0176 | B | F | # | 0.0042 | - |
| | mg/L | GJ01-01 | WL | 01/08/2002 | 0001 | AL | | 0.020 | B | F | # | 0.0042 | - |
| | mg/L | GJ01-02 | WL | 01/10/2002 | 0001 | AL | | 5.780 | | F | # | 0.0042 | - |
| | mg/L | GJ84-04 | WL | 01/09/2002 | 0001 | | D | 0.260 | | F | # | 0.0042 | - |
| Arsenic | mg/L | 10-19N | WL | 01/09/2002 | 0001 | | O | 0.0021 | B | F | # | 0.0006 | - |
| | mg/L | 11-1S | WL | 01/08/2002 | 0001 | | O | 0.0006 | U | F | # | 0.0006 | - |
| | mg/L | 11-1S | WL | 01/08/2002 | 0002 | | O | 0.0006 | U | F | # | 0.0006 | - |
| | mg/L | 14-13NA | WL | 01/09/2002 | 0001 | | O | 0.010 | | F | # | 0.0006 | - |
| | mg/L | 6-2N | WL | 01/07/2002 | 0001 | | O | 0.0014 | B | F | # | 0.0006 | - |
| | mg/L | 8-4S | WL | 01/07/2002 | 0001 | | O | 0.0013 | B | F | # | 0.0006 | - |
| | mg/L | GJ01-01 | WL | 01/08/2002 | 0001 | AL | | 0.0079 | | F | # | 0.0006 | - |
| | mg/L | GJ01-02 | WL | 01/10/2002 | 0001 | AL | | 0.006 | | F | # | 0.0006 | - |
| | mg/L | GJ84-04 | WL | 01/09/2002 | 0001 | | D | 0.010 | | F | # | 0.0006 | - |

CLASSIC GROUND WATER QUALITY DATA BY PARAMETER WITH ZONE (USEE201) FOR SITE GJO01, GRAND JUNCTION OFFICE (GJO)
REPORT DATE: 5/19/2003 9:37 am

| PARAMETER | UNITS | LOCATION ID | LOCATION TYPE | SAMPLE: DATE | SAMPLE: ID | ZONE COMPL | FLOW REL. | RESULT | QUALIFIERS: LAB | QUALIFIERS: DATA | QUALIFIERS: QA | DETECTION LIMIT | UN-CERTAINTY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | mg/L | 10-19N | WL | 01/09/2002 | 0001 | | O | 306.000 | | F | # | 1.87 | - |
| | mg/L | 11-1S | WL | 01/08/2002 | 0001 | | O | 7.740 | | F | # | 0.374 | - |
| | mg/L | 11-1S | WL | 01/08/2002 | 0002 | | O | 7.980 | | F | # | 0.187 | - |
| | mg/L | 14-13NA | WL | 01/09/2002 | 0001 | | O | 130.000 | | F | # | 1.87 | - |
| | mg/L | 6-2N | WL | 01/07/2002 | 0001 | | O | 83.200 | | F | # | 0.374 | - |
| | mg/L | 8-4S | WL | 01/07/2002 | 0001 | | O | 98.000 | | F | # | 0.374 | - |
| | mg/L | GJ01-01 | WL | 01/08/2002 | 0001 | AL | | 67.700 | | F | # | 0.748 | - |
| | mg/L | GJ01-02 | WL | 01/10/2002 | 0001 | AL | | 62.700 | | F | # | 0.374 | - |
| | mg/L | GJ84-04 | WL | 01/09/2002 | 0001 | | D | 92.000 | | F | # | 0.748 | - |
| Chromium | mg/L | 10-19N | WL | 01/09/2002 | 0001 | | O | 0.0008 | U | F | # | 0.0008 | - |
| | mg/L | 11-1S | WL | 01/08/2002 | 0001 | | O | 0.0008 | U | F | # | 0.0008 | - |
| | mg/L | 11-1S | WL | 01/08/2002 | 0002 | | O | 0.0008 | U | F | # | 0.0008 | - |
| | mg/L | 14-13NA | WL | 01/09/2002 | 0001 | | O | 0.0008 | U | F | # | 0.0008 | - |
| | mg/L | 6-2N | WL | 01/07/2002 | 0001 | | O | 0.0008 | U | F | # | 0.0008 | - |
| | mg/L | 8-4S | WL | 01/07/2002 | 0001 | | O | 0.0008 | U | F | # | 0.0008 | - |
| | mg/L | GJ01-01 | WL | 01/08/2002 | 0001 | AL | | 0.0008 | U | F | # | 0.0008 | - |
| | mg/L | GJ01-02 | WL | 01/10/2002 | 0001 | AL | | 0.0008 | U | F | # | 0.0008 | - |
| | mg/L | GJ84-04 | WL | 01/09/2002 | 0001 | | D | 0.0008 | U | F | # | 0.0008 | - |
| Dissolved Oxygen | mg/L | 10-19N | WL | 01/09/2002 | N001 | | O | 0.39 | | F | # | - | - |
| | mg/L | 11-1S | WL | 01/08/2002 | N001 | | O | 0.47 | | F | # | - | - |
| | mg/L | 14-13NA | WL | 01/09/2002 | N001 | | O | 0.29 | | F | # | - | - |
| | mg/L | GJ01-01 | WL | 01/08/2002 | N001 | AL | | 0.36 | | F | # | - | - |
| | mg/L | GJ01-02 | WL | 01/10/2002 | N001 | AL | | 1.14 | | F | # | - | - |
| | mg/L | GJ84-04 | WL | 01/09/2002 | N001 | | D | 0.39 | | F | # | - | - |
| Gross Alpha | pCi/L | 10-19N | WL | 01/09/2002 | 0001 | | O | 95.2 | | F | # | 41.04 | ± 33.4 |
| | pCi/L | 11-1S | WL | 01/08/2002 | 0001 | | O | 68.27 | | F | # | 6.69 | ± 9.75 |

CLASSIC GROUND WATER QUALITY DATA BY PARAMETER WITH ZONE (USEE201) FOR SITE GJO01, GRAND JUNCTION OFFICE (GJO)
REPORT DATE: 5/19/2003 9:37 am

| PARAMETER | UNITS | LOCATION ID | LOCATION TYPE | SAMPLE: DATE | SAMPLE: ID | ZONE COMPL | FLOW REL. | RESULT | QUALIFIERS: LAB | QUALIFIERS: DATA | QUALIFIERS: QA | DETECTION LIMIT | UN-CERTAINTY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Gross Alpha | pCi/L | 11-1S | WL | 01/08/2002 | 0002 | | O | 61.22 | | F | # | 6.65 | ± 9.21 |
| | pCi/L | 14-13NA | WL | 01/09/2002 | 0001 | | O | 130.69 | | F | # | 25.76 | ± 27.5 |
| | pCi/L | 6-2N | WL | 01/07/2002 | 0001 | | O | 148.62 | | F | # | 21.43 | ± 26.1 |
| | pCi/L | 8-4S | WL | 01/07/2002 | 0001 | | O | 375.94 | | F | # | 17.57 | ± 37.5 |
| | pCi/L | GJ01-01 | WL | 01/08/2002 | 0001 | AL | | 262.89 | | F | # | 15.17 | ± 28.8 |
| | pCi/L | GJ01-02 | WL | 01/10/2002 | 0001 | AL | | 135.28 | | F | # | 9.71 | ± 16.4 |
| | pCi/L | GJ84-04 | WL | 01/09/2002 | 0001 | | D | 94.45 | | F | # | 21.68 | ± 21.8 |
| Gross Beta | pCi/L | 10-19N | WL | 01/09/2002 | 0001 | | O | 48.51 | B | F | # | 36.19 | ± 23.2 |
| | pCi/L | 11-1S | WL | 01/08/2002 | 0001 | | O | 12.56 | B | F | # | 6.08 | ± 4.11 |
| | pCi/L | 11-1S | WL | 01/08/2002 | 0002 | | O | 16.2 | B | F | # | 6.04 | ± 4.27 |
| | pCi/L | 14-13NA | WL | 01/09/2002 | 0001 | | O | 57.64 | B | F | # | 23.55 | ± 16.4 |
| | pCi/L | 6-2N | WL | 01/07/2002 | 0001 | | O | 36.61 | B | F | # | 19.85 | ± 13.2 |
| | pCi/L | 8-4S | WL | 01/07/2002 | 0001 | | O | 67.85 | B | F | # | 16.19 | ± 12.4 |
| | pCi/L | GJ01-01 | WL | 01/08/2002 | 0001 | AL | | 55.89 | B | F | # | 14.07 | ± 10.7 |
| | pCi/L | GJ01-02 | WL | 01/10/2002 | 0001 | AL | | 28.58 | B | F | # | 7.8 | ± 5.86 |
| | pCi/L | GJ84-04 | WL | 01/09/2002 | 0001 | | D | 33.18 | B | F | # | 19.54 | ± 12.9 |
| Manganese | mg/L | 10-19N | WL | 01/09/2002 | 0001 | | O | 1.380 | | F | # | 0.0001 | - |
| | mg/L | 11-1S | WL | 01/08/2002 | 0001 | | O | 0.140 | | F | # | 0.0001 | - |
| | mg/L | 11-1S | WL | 01/08/2002 | 0002 | | O | 0.142 | | F | # | 0.0001 | - |
| | mg/L | 14-13NA | WL | 01/09/2002 | 0001 | | O | 4.150 | | F | # | 0.0001 | - |
| | mg/L | 6-2N | WL | 01/07/2002 | 0001 | | O | 1.410 | | F | # | 0.0001 | - |
| | mg/L | 8-4S | WL | 01/07/2002 | 0001 | | O | 0.201 | | F | # | 0.0001 | - |
| | mg/L | GJ01-01 | WL | 01/08/2002 | 0001 | AL | | 0.587 | | F | # | 0.0001 | - |
| | mg/L | GJ01-02 | WL | 01/10/2002 | 0001 | AL | | 2.780 | | F | # | 0.0001 | - |
| | mg/L | GJ84-04 | WL | 01/09/2002 | 0001 | | D | 3.480 | | F | # | 0.0001 | - |
| Molybdenum | mg/L | 10-19N | WL | 01/09/2002 | 0001 | | O | 0.0442 | | F | # | 0.0015 | - |

CLASSIC GROUND WATER QUALITY DATA BY PARAMETER WITH ZONE (USEE201) FOR SITE GJO01, GRAND JUNCTION OFFICE (GJO)
REPORT DATE: 5/19/2003 9:37 am

| PARAMETER | UNITS | LOCATION ID | LOCATION TYPE | SAMPLE: DATE | SAMPLE: ID | ZONE COMPL | FLOW REL. | RESULT | QUALIFIERS: LAB | QUALIFIERS: DATA | QUALIFIERS: QA | DETECTION LIMIT | UN-CERTAINTY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Molybdenum | mg/L | 11-1S | WL | 01/08/2002 | 0001 | | O | 0.0271 | | F | # | 0.0015 | - |
| | mg/L | 11-1S | WL | 01/08/2002 | 0002 | | O | 0.0272 | | F | # | 0.0015 | - |
| | mg/L | 14-13NA | WL | 01/09/2002 | 0001 | | O | 0.221 | | F | # | 0.0015 | - |
| | mg/L | 6-2N | WL | 01/07/2002 | 0001 | | O | 0.0465 | | F | # | 0.0015 | - |
| | mg/L | 8-4S | WL | 01/07/2002 | 0001 | | O | 0.256 | | F | # | 0.0015 | - |
| | mg/L | GJ01-01 | WL | 01/08/2002 | 0001 | AL | | 0.151 | | F | # | 0.0015 | - |
| | mg/L | GJ01-02 | WL | 01/10/2002 | 0001 | AL | | 0.0367 | | F | # | 0.0015 | - |
| | mg/L | GJ84-04 | WL | 01/09/2002 | 0001 | | D | 0.111 | | F | # | 0.0015 | - |
| Nitrate as NO3 | mg/L | 10-19N | WL | 01/09/2002 | 0001 | | O | 1.560 | | F | # | 0.0305 | - |
| | mg/L | 11-1S | WL | 01/08/2002 | 0001 | | O | 0.587 | B | F | # | 0.0305 | - |
| | mg/L | 11-1S | WL | 01/08/2002 | 0002 | | O | 0.336 | B | F | # | 0.0305 | - |
| | mg/L | 14-13NA | WL | 01/09/2002 | 0001 | | O | 1.410 | | F | # | 0.0305 | - |
| | mg/L | 6-2N | WL | 01/07/2002 | 0001 | | O | 37.400 | | F | # | 0.0305 | - |
| | mg/L | 8-4S | WL | 01/07/2002 | 0001 | | O | 15.800 | | F | # | 0.0305 | - |
| | mg/L | GJ01-01 | WL | 01/08/2002 | 0001 | AL | | 37.600 | | F | # | 0.0305 | - |
| | mg/L | GJ01-02 | WL | 01/10/2002 | 0001 | AL | | 0.0325 | B | F | # | 0.0305 | - |
| | mg/L | GJ84-04 | WL | 01/09/2002 | 0001 | | D | 0.673 | B | F | # | 0.0305 | - |
| ORP of Zobell Solution | mV | 10-19N | WL | 01/09/2002 | N001 | | O | 215 | | F | # | - | - |
| | mV | 14-13NA | WL | 01/09/2002 | N001 | | O | 215 | | F | # | - | - |
| | mV | 6-2N | WL | 01/07/2002 | N001 | | O | 215 | | F | # | - | - |
| | mV | 8-4S | WL | 01/07/2002 | N001 | | O | 215 | | F | # | - | - |
| Oxidation Reduction Potent | mV | 10-19N | WL | 01/09/2002 | N001 | | O | -7.6 | | F | # | - | - |
| | mV | 11-1S | WL | 01/08/2002 | N001 | | O | 162 | | F | # | - | - |
| | mV | 14-13NA | WL | 01/09/2002 | N001 | | O | 45.2 | | F | # | - | - |
| | mV | 6-2N | WL | 01/07/2002 | N001 | | O | 62 | | F | # | - | - |
| | mV | 8-4S | WL | 01/07/2002 | N001 | | O | 43 | | F | # | - | - |

CLASSIC GROUND WATER QUALITY DATA BY PARAMETER WITH ZONE (USEE201) FOR SITE GJO01, GRAND JUNCTION OFFICE (GJO)
REPORT DATE: 5/19/2003 9:37 am

| PARAMETER | UNITS | LOCATION ID | LOCATION TYPE | SAMPLE: DATE | SAMPLE: ID | ZONE COMPL | FLOW REL. | RESULT | QUALIFIERS: LAB | QUALIFIERS: DATA | QUALIFIERS: QA | DETECTION LIMIT | UN-CERTAINTY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Oxidation Reduction Potent | mV | GJ01-01 | WL | 01/08/2002 | N001 | AL | | 78.7 | | F | # | - | - |
| | mV | GJ01-02 | WL | 01/10/2002 | N001 | AL | | -67 | | F | # | - | - |
| | mV | GJ84-04 | WL | 01/09/2002 | N001 | | D | -27 | | F | # | - | - |
| pH | s.u. | 10-19N | WL | 01/09/2002 | N001 | | O | 7.12 | | F | # | - | - |
| | s.u. | 11-1S | WL | 01/08/2002 | N001 | | O | 7.23 | | F | # | - | - |
| | s.u. | 14-13NA | WL | 01/09/2002 | N001 | | O | 7.12 | | F | # | - | - |
| | s.u. | 6-2N | WL | 01/07/2002 | N001 | | O | 7.52 | | F | # | - | - |
| | s.u. | 8-4S | WL | 01/07/2002 | N001 | | O | 7.16 | | F | # | - | - |
| | s.u. | GJ01-01 | WL | 01/08/2002 | N001 | AL | | 7.31 | | F | # | - | - |
| | s.u. | GJ01-02 | WL | 01/10/2002 | N001 | AL | | 7.27 | | F | # | - | - |
| | s.u. | GJ84-04 | WL | 01/09/2002 | N001 | | D | 7.24 | | F | # | - | - |
| Radium-226 | pCi/L | 10-19N | WL | 01/09/2002 | 0001 | | O | 0.1 | | F | # | 0.08 | ± 0.05 |
| | pCi/L | 11-1S | WL | 01/08/2002 | 0001 | | O | 0.08 | U | F | # | 0.08 | ± 0.05 |
| | pCi/L | 11-1S | WL | 01/08/2002 | 0002 | | O | 0.07 | U | F | # | 0.07 | ± 0.04 |
| | pCi/L | 14-13NA | WL | 01/09/2002 | 0001 | | O | 0.08 | U | F | # | 0.08 | ± 0.05 |
| | pCi/L | 6-2N | WL | 01/07/2002 | 0001 | | O | 0.09 | U | F | # | 0.09 | ± 0.06 |
| | pCi/L | 8-4S | WL | 01/07/2002 | 0001 | | O | 0.14 | | F | # | 0.08 | ± 0.06 |
| | pCi/L | GJ01-01 | WL | 01/08/2002 | 0001 | AL | | 0.08 | | F | # | 0.07 | ± 0.05 |
| | pCi/L | GJ01-02 | WL | 01/10/2002 | 0001 | AL | | 0.16 | | F | # | 0.07 | ± 0.05 |
| | pCi/L | GJ84-04 | WL | 01/09/2002 | 0001 | | D | 0.09 | U | F | # | 0.09 | ± 0.05 |
| Radium-228 | pCi/L | 10-19N | WL | 01/09/2002 | 0001 | | O | 0.7 | U | F | # | 0.7 | ± 0.42 |
| | pCi/L | 11-1S | WL | 01/08/2002 | 0001 | | O | 0.69 | U | F | # | 0.69 | ± 0.41 |
| | pCi/L | 11-1S | WL | 01/08/2002 | 0002 | | O | 0.64 | U | F | # | 0.64 | ± 0.38 |
| | pCi/L | 14-13NA | WL | 01/09/2002 | 0001 | | O | 0.76 | U | F | # | 0.76 | ± 0.45 |
| | pCi/L | 6-2N | WL | 01/07/2002 | 0001 | | O | 0.75 | U | F | # | 0.75 | ± 0.45 |
| | pCi/L | 8-4S | WL | 01/07/2002 | 0001 | | O | 0.73 | U | F | # | 0.73 | ± 0.43 |

CLASSIC GROUND WATER QUALITY DATA BY PARAMETER WITH ZONE (USEE201) FOR SITE GJO01, GRAND JUNCTION OFFICE (GJO)
REPORT DATE: 5/19/2003 9:37 am

| PARAMETER | UNITS | LOCATION ID | LOCATION TYPE | SAMPLE: DATE | SAMPLE: ID | ZONE COMPL | FLOW REL. | RESULT | QUALIFIERS: LAB | QUALIFIERS: DATA | QUALIFIERS: QA | DETECTION LIMIT | UN-CERTAINTY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Radium-228 | pCi/L | GJ01-01 | WL | 01/08/2002 | 0001 | AL | | 0.68 | U | F | # | 0.68 | ± 0.40 |
| | pCi/L | GJ01-02 | WL | 01/10/2002 | 0001 | AL | | 0.64 | U | F | # | 0.64 | ± 0.38 |
| | pCi/L | GJ84-04 | WL | 01/09/2002 | 0001 | | D | 0.81 | U | F | # | 0.81 | ± 0.48 |
| Selenium | mg/L | 10-19N | WL | 01/09/2002 | 0001 | | O | 0.0025 | B | UF | # | 0.0003 | - |
| | mg/L | 11-1S | WL | 01/08/2002 | 0001 | | O | 0.00095 | B | F | # | 0.0003 | - |
| | mg/L | 11-1S | WL | 01/08/2002 | 0002 | | O | 0.0013 | B | UF | # | 0.0003 | - |
| | mg/L | 14-13NA | WL | 01/09/2002 | 0001 | | O | 0.00082 | B | UF | # | 0.0003 | - |
| | mg/L | 6-2N | WL | 01/07/2002 | 0001 | | O | 0.116 | | F | # | 0.003 | - |
| | mg/L | 8-4S | WL | 01/07/2002 | 0001 | | O | 0.0509 | | F | # | 0.0015 | - |
| | mg/L | GJ01-01 | WL | 01/08/2002 | 0001 | AL | | 0.0634 | | F | # | 0.0015 | - |
| | mg/L | GJ01-02 | WL | 01/10/2002 | 0001 | AL | | 0.0003 | U | F | # | 0.0003 | - |
| | mg/L | GJ84-04 | WL | 01/09/2002 | 0001 | | D | 0.00038 | B | UF | # | 0.0003 | - |
| Specific Conductance | umhos/cm | 10-19N | WL | 01/09/2002 | N001 | | O | 5308 | | F | # | - | - |
| | umhos/cm | 11-1S | WL | 01/08/2002 | N001 | | O | 975 | | F | # | - | - |
| | umhos/cm | 14-13NA | WL | 01/09/2002 | N001 | | O | 3393 | | F | # | - | - |
| | umhos/cm | 6-2N | WL | 01/07/2002 | N001 | | O | 2860 | | F | # | - | - |
| | umhos/cm | 8-4S | WL | 01/07/2002 | N001 | | O | 2490 | | F | # | - | - |
| | umhos/cm | GJ01-01 | WL | 01/08/2002 | N001 | AL | | 2116 | | F | # | - | - |
| | umhos/cm | GJ01-02 | WL | 01/10/2002 | N001 | AL | | 1549 | | F | # | - | - |
| | umhos/cm | GJ84-04 | WL | 01/09/2002 | N001 | | D | 2976 | | F | # | - | - |
| Sulfate | mg/L | 10-19N | WL | 01/09/2002 | 0001 | | O | 2440.000 | | F | # | 2.05 | - |
| | mg/L | 11-1S | WL | 01/08/2002 | 0001 | | O | 343.000 | | F | # | 0.41 | - |
| | mg/L | 11-1S | WL | 01/08/2002 | 0002 | | O | 342.000 | | F | # | 0.205 | - |
| | mg/L | 14-13NA | WL | 01/09/2002 | 0001 | | O | 1760.000 | | F | # | 2.05 | - |
| | mg/L | 6-2N | WL | 01/07/2002 | 0001 | | O | 1340.000 | | F | # | 0.82 | - |
| | mg/L | 8-4S | WL | 01/07/2002 | 0001 | | O | 983.000 | | F | # | 0.41 | - |

CLASSIC GROUND WATER QUALITY DATA BY PARAMETER WITH ZONE (USEE201) FOR SITE GJO01, GRAND JUNCTION OFFICE (GJO)
REPORT DATE: 5/19/2003 9:37 am

| PARAMETER | UNITS | LOCATION ID | LOCATION TYPE | SAMPLE: DATE | SAMPLE: ID | ZONE COMPL | FLOW REL. | RESULT | QUALIFIERS: LAB | QUALIFIERS: DATA | QUALIFIERS: QA | DETECTION LIMIT | UN-CERTAINTY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sulfate | mg/L | GJ01-01 | WL | 01/08/2002 | 0001 | AL | | 762.000 | | F | # | 0.82 | - |
| | mg/L | GJ01-02 | WL | 01/10/2002 | 0001 | AL | | 411.000 | | F | # | 0.41 | - |
| | mg/L | GJ84-04 | WL | 01/09/2002 | 0001 | | D | 1420.000 | | F | # | 0.82 | - |
| Temperature | C | 10-19N | WL | 01/09/2002 | N001 | | O | 14.2 | | F | # | - | - |
| | C | 11-1S | WL | 01/08/2002 | N001 | | O | 14.76 | | F | # | - | - |
| | C | 14-13NA | WL | 01/09/2002 | N001 | | O | 15 | | F | # | - | - |
| | C | 6-2N | WL | 01/07/2002 | N001 | | O | 17.8 | | F | # | - | - |
| | C | 8-4S | WL | 01/07/2002 | N001 | | O | 14.3 | | F | # | - | - |
| | C | GJ01-01 | WL | 01/08/2002 | N001 | AL | | 16.64 | | F | # | - | - |
| | C | GJ01-02 | WL | 01/10/2002 | N001 | AL | | 13.76 | | F | # | - | - |
| | C | GJ84-04 | WL | 01/09/2002 | N001 | | D | 13.9 | | F | # | - | - |
| Temperature of Zobell Solu | C | 10-19N | WL | 01/09/2002 | N001 | | O | 15.6 | | F | # | - | - |
| | C | 14-13NA | WL | 01/09/2002 | N001 | | O | 15.6 | | F | # | - | - |
| | C | 6-2N | WL | 01/07/2002 | N001 | | O | 15.6 | | F | # | - | - |
| | C | 8-4S | WL | 01/07/2002 | N001 | | O | 15.6 | | F | # | - | - |
| Total Dissolved Solids | mg/L | 10-19N | WL | 01/09/2002 | 0001 | | O | 4480 | | F | # | 10 | - |
| | mg/L | 11-1S | WL | 01/08/2002 | 0001 | | O | 708 | | F | # | 10 | - |
| | mg/L | 11-1S | WL | 01/08/2002 | 0002 | | O | 738 | | F | # | 10 | - |
| | mg/L | 14-13NA | WL | 01/09/2002 | 0001 | | O | 2860 | | F | # | 10 | - |
| | mg/L | 6-2N | WL | 01/07/2002 | 0001 | | O | 2350 | | F | # | 10 | - |
| | mg/L | 8-4S | WL | 01/07/2002 | 0001 | | O | 1970 | | F | # | 10 | - |
| | mg/L | GJ01-01 | WL | 01/08/2002 | 0001 | AL | | 1610 | | F | # | 10 | - |
| | mg/L | GJ01-02 | WL | 01/10/2002 | 0001 | AL | | 1080 | | F | # | 10 | - |
| | mg/L | GJ84-04 | WL | 01/09/2002 | 0001 | | D | 2430 | | F | # | 10 | - |
| Turbidity | NTU | 10-19N | WL | 01/09/2002 | N001 | | O | 3.5 | | F | # | - | - |

CLASSIC GROUND WATER QUALITY DATA BY PARAMETER WITH ZONE (USEE201) FOR SITE GJO01, GRAND JUNCTION OFFICE (GJO)
REPORT DATE: 5/19/2003 9:37 am

| PARAMETER | UNITS | LOCATION ID | LOCATION TYPE | SAMPLE: DATE | SAMPLE: ID | ZONE COMPL | FLOW REL. | RESULT | QUALIFIERS: LAB | QUALIFIERS: DATA | QUALIFIERS: QA | DETECTION LIMIT | UN-CERTAINTY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Turbidity | NTU | 11-1S | WL | 01/08/2002 | N001 | | O | 6.6 | | F | # | - | - |
| | NTU | 14-13NA | WL | 01/09/2002 | N001 | | O | 8 | | F | # | - | - |
| | NTU | 6-2N | WL | 01/07/2002 | N001 | | O | 1.8 | | F | # | - | - |
| | NTU | 8-4S | WL | 01/07/2002 | N001 | | O | 9.99 | | F | # | - | - |
| | NTU | GJ01-01 | WL | 01/08/2002 | N001 | AL | | 8 | | F | # | - | - |
| | NTU | GJ01-02 | WL | 01/10/2002 | N001 | AL | | 156 | | F | # | - | - |
| | NTU | GJ84-04 | WL | 01/09/2002 | N001 | | D | 2.2 | | F | # | - | - |
| Uranium | mg/L | 10-19N | WL | 01/09/2002 | 0001 | | O | 0.218 | | F | # | 0.0001 | - |
| | mg/L | 11-1S | WL | 01/08/2002 | 0001 | | O | 0.121 | | F | # | 0.0001 | - |
| | mg/L | 11-1S | WL | 01/08/2002 | 0002 | | O | 0.121 | | F | # | 0.0001 | - |
| | mg/L | 14-13NA | WL | 01/09/2002 | 0001 | | O | 0.243 | | F | # | 0.0001 | - |
| | mg/L | 6-2N | WL | 01/07/2002 | 0001 | | O | 0.268 | | F | # | 0.0001 | - |
| | mg/L | 8-4S | WL | 01/07/2002 | 0001 | | O | 0.583 | | F | # | 0.001 | - |
| | mg/L | GJ01-01 | WL | 01/08/2002 | 0001 | AL | | 0.507 | | F | # | 0.001 | - |
| | mg/L | GJ01-02 | WL | 01/10/2002 | 0001 | AL | | 0.222 | | F | # | 0.0001 | - |
| | mg/L | GJ84-04 | WL | 01/09/2002 | 0001 | | D | 0.164 | | F | # | 0.0001 | - |
| Vanadium | mg/L | 10-19N | WL | 01/09/2002 | 0001 | | O | 0.0022 | B | F | # | 0.0004 | - |
| | mg/L | 11-1S | WL | 01/08/2002 | 0001 | | O | 0.0032 | B | F | # | 0.0004 | - |
| | mg/L | 11-1S | WL | 01/08/2002 | 0002 | | O | 0.0034 | B | F | # | 0.0004 | - |
| | mg/L | 14-13NA | WL | 01/09/2002 | 0001 | | O | 0.0125 | | F | # | 0.0004 | - |
| | mg/L | 6-2N | WL | 01/07/2002 | 0001 | | O | 0.0112 | | F | # | 0.0004 | - |
| | mg/L | 8-4S | WL | 01/07/2002 | 0001 | | O | 0.0111 | | F | # | 0.0004 | - |
| | mg/L | GJ01-01 | WL | 01/08/2002 | 0001 | AL | | 0.192 | | F | # | 0.0004 | - |
| | mg/L | GJ01-02 | WL | 01/10/2002 | 0001 | AL | | 0.00083 | B | F | # | 0.0004 | - |
| | mg/L | GJ84-04 | WL | 01/09/2002 | 0001 | | D | 0.0107 | | F | # | 0.0004 | - |

CLASSIC GROUND WATER QUALITY DATA BY PARAMETER WITH ZONE (USEE201) FOR SITE GJO01, GRAND JUNCTION OFFICE (GJO)
REPORT DATE: 5/19/2003 9:37 am

| PARAMETER | UNITS | LOCATION ID | LOCATION TYPE | SAMPLE: DATE | ID | ZONE COMPL | FLOW REL. | RESULT | QUALIFIERS: LAB | DATA | QA | DETECTION LIMIT | UN-CERTAINTY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

RECORDS: SELECTED FROM USEE200 WHERE site_code='GJO01' AND quality_assurance = TRUE AND (data_validation_qualifiers IS NULL OR data_validation_qualifiers NOT LIKE '%R%' AND data_validation_qualifiers NOT LIKE '%X%' ) AND DATE_SAMPLED between #1/1/2002# and #1/15/2002#

SAMPLE ID CODES: 000X = Filtered sample (0.45 µm). N00X = Unfiltered sample. X = replicate number.

LOCATION TYPES: WL WELL

ZONES OF COMPLETION:

AL ALLUVIUM

FLOW CODES: D DOWN GRADIENT O ON-SITE

LAB QUALIFIERS:

| | |
|---|---|
| * | Replicate analysis not within control limits. |
| + | Correlation coefficient for MSA < 0.995. |
| > | Result above upper detection limit. |
| A | TIC is a suspected aldol-condensation product. |
| B | Inorganic: Result is between the IDL and CRDL. Organic: Analyte also found in method blank. |
| C | Pesticide result confirmed by GC-MS. |
| D | Analyte determined in diluted sample. |
| E | Inorganic: Estimate value because of interference, see case narrative. Organic: Analyte exceeded calibration range of the GC-MS. |
| H | Holding time expired, value suspect. |
| I | Increased detection limit due to required dilution. |
| J | Estimated |
| M | GFAA duplicate injection precision not met. |
| N | Inorganic or radiochemical: Spike sample recovery not within control limits. Organic: Tentatively identified compund (TIC). |
| P | > 25% difference in detected pesticide or Arochlor concentrations between 2 columns. |
| S | Result determined by method of standard addition (MSA). |
| U | Analytical result below detection limit. |
| W | Post-digestion spike outside control limits while sample absorbance < 50% of analytical spike absorbance. |
| X | Laboratory defined (USEPA CLP organic) qualifier, see case narrative. |
| Y | Laboratory defined (USEPA CLP organic) qualifier, see case narrative. |
| Z | Laboratory defined (USEPA CLP organic) qualifier, see case narrative. |

DATA QUALIFIERS:

| | | | | | |
|---|---|---|---|---|---|
| F | Low flow sampling method used. | G | Possible grout contamination, pH > 9. | J | Estimated value. |
| L | Less than 3 bore volumes purged prior to sampling. | Q | Qualitative result due to sampling technique | R | Unusable result. |
| U | Parameter analyzed for but was not detected. | X | Location is undefined. | | |

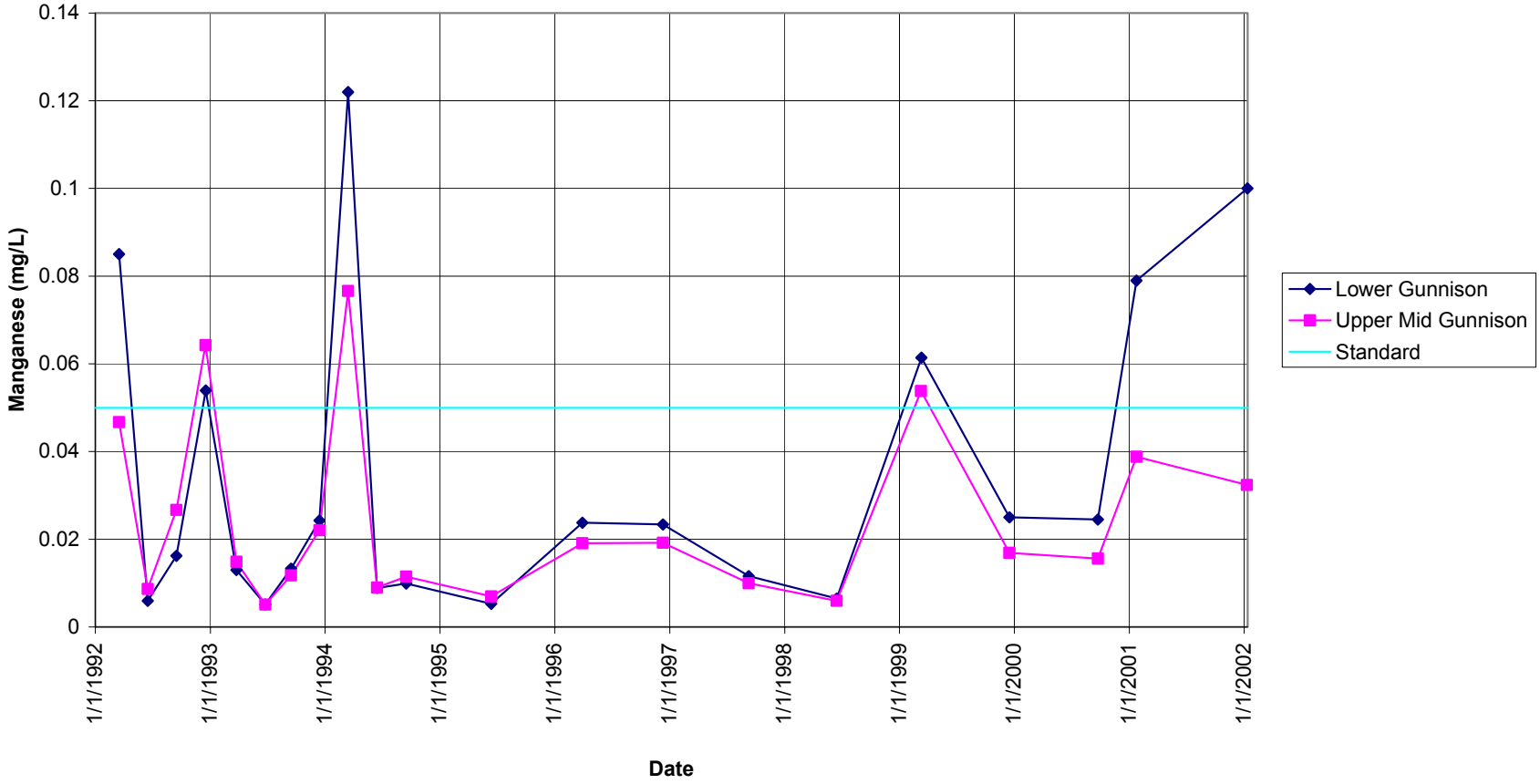
QA QUALIFIER: # = validated according to Quality Assurance guidelines.

# Appendix B

# Time-Concentration Graphs

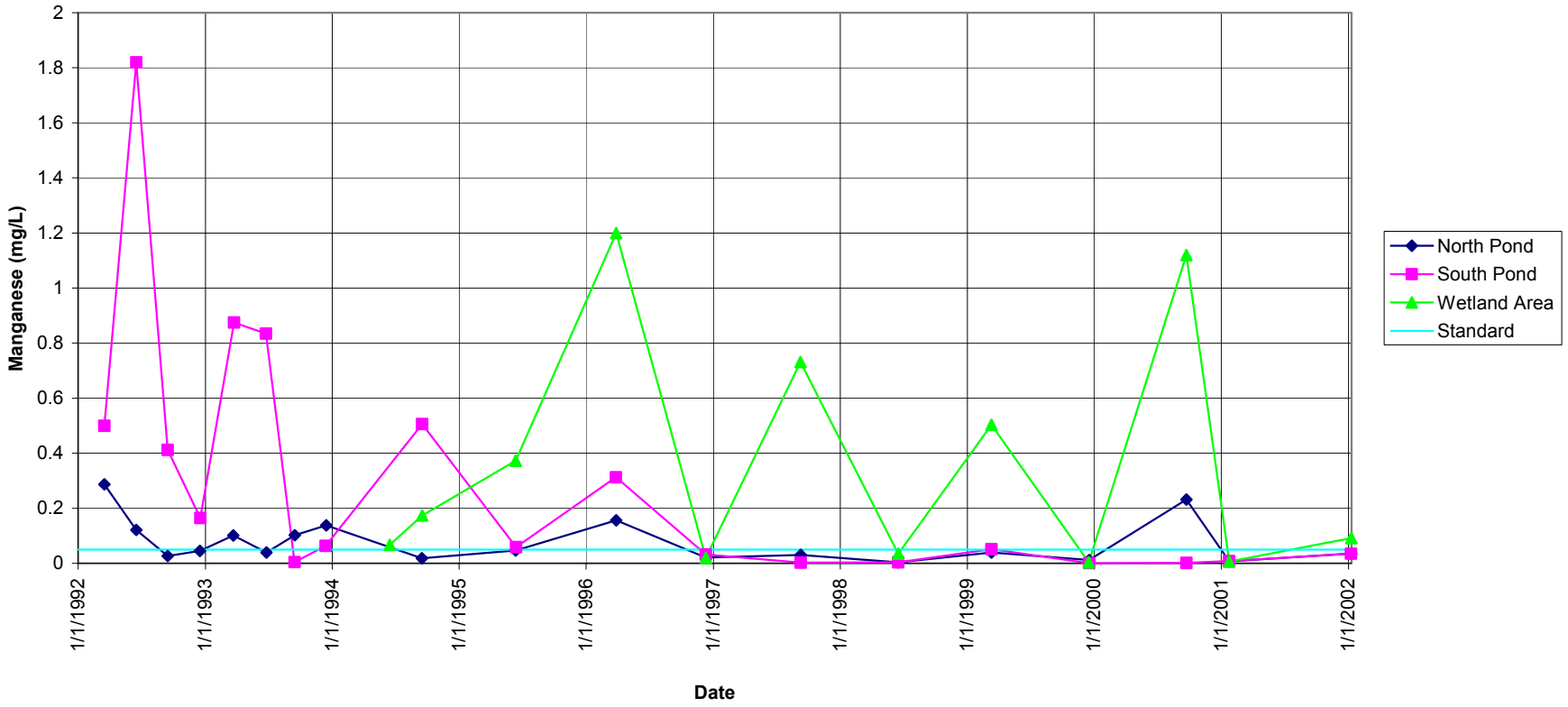
## GRAND JUNCTION OFFICE

### Manganese Concentration



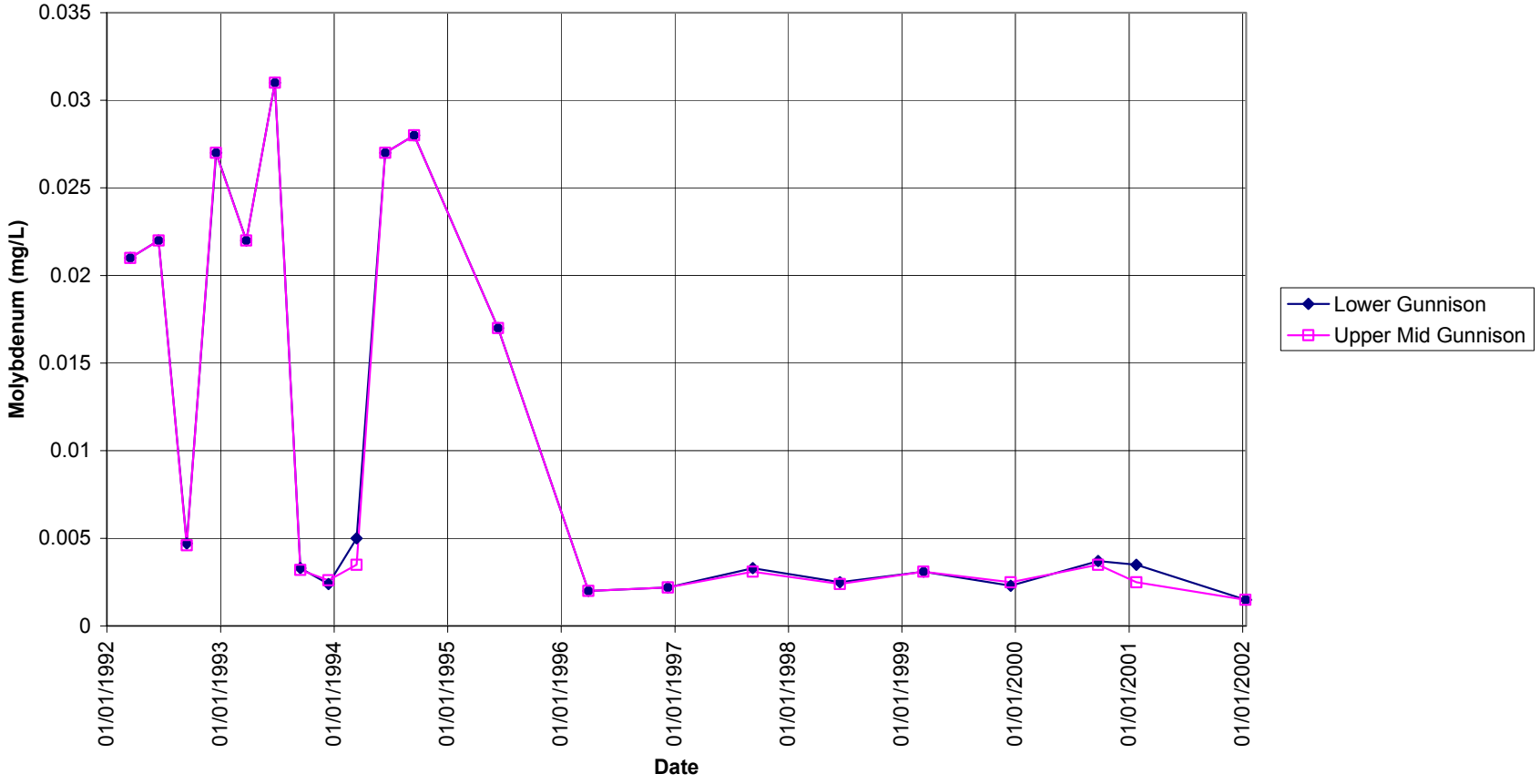
## GRAND JUNCTION OFFICE

### Manganese Concentration



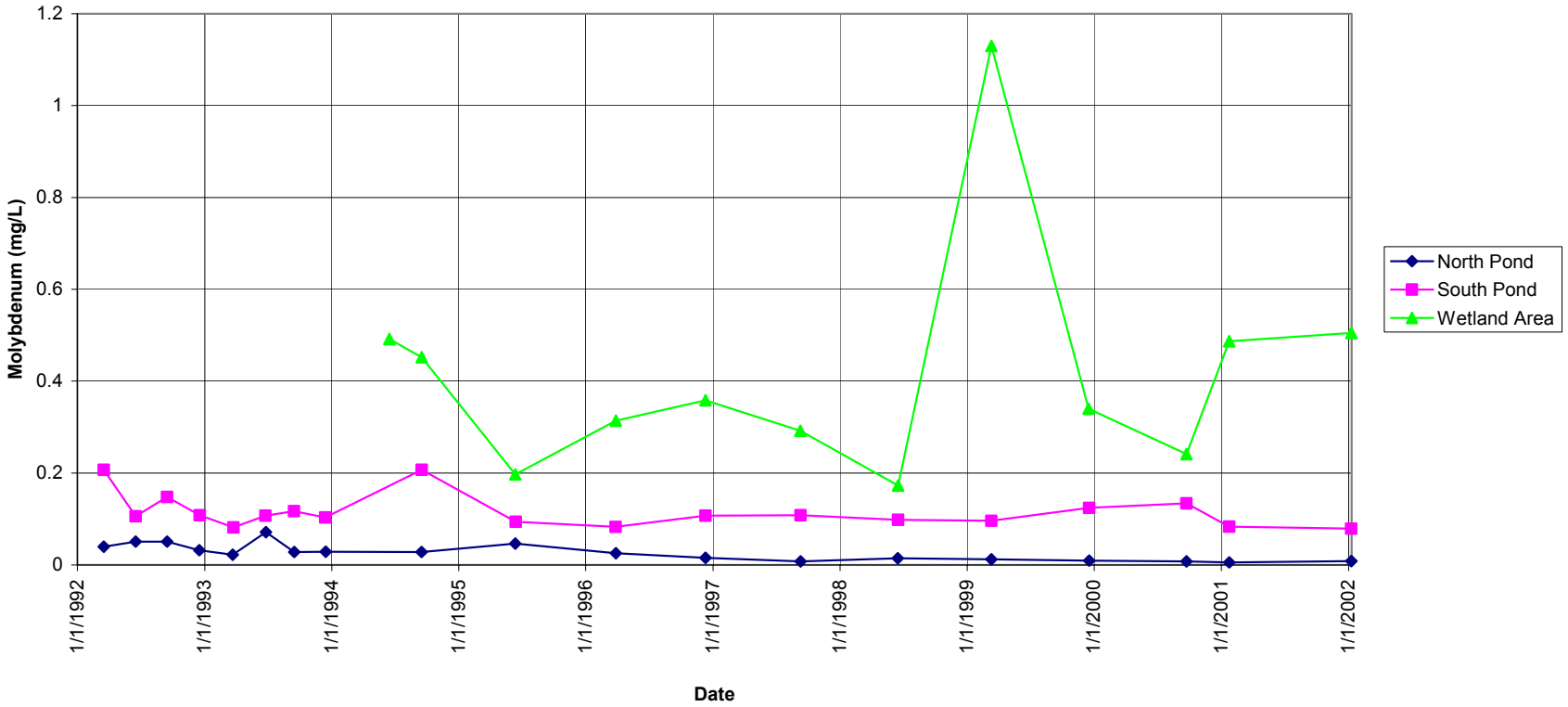
**GRAND JUNCTION OFFICE**

**Molybdenum Concentration**



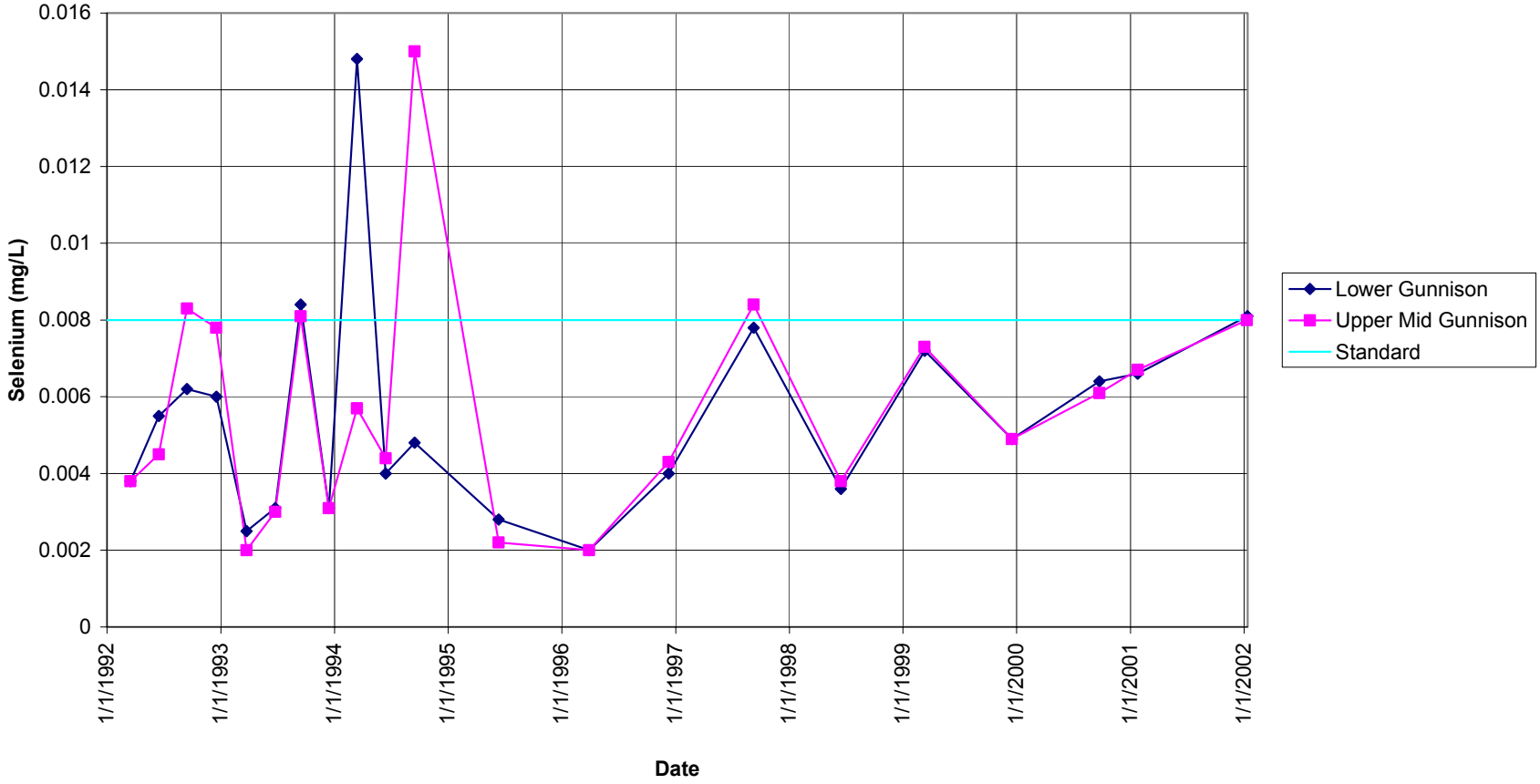
**GRAND JUNCTION OFFICE**

**Molybdenum Concentration**



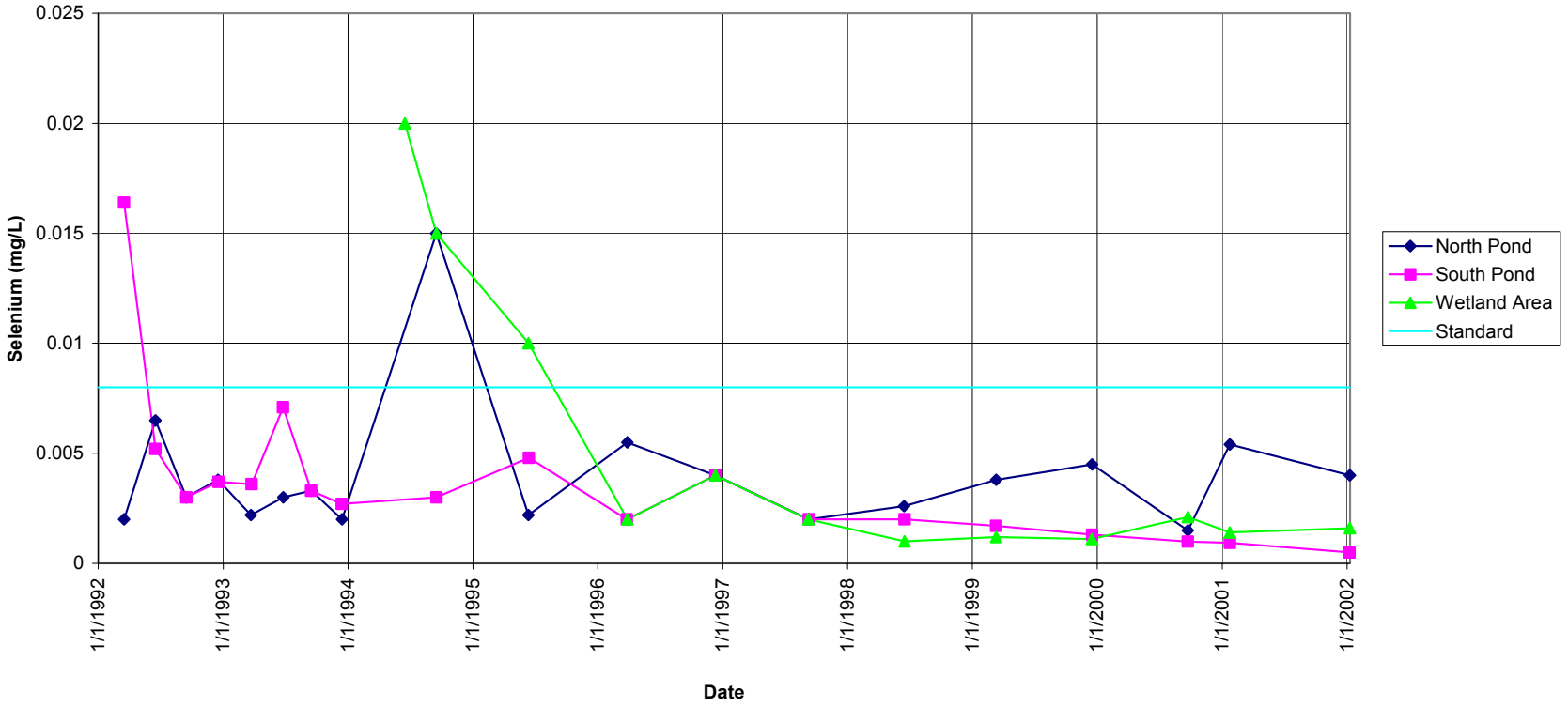
## GRAND JUNCTION OFFICE

### Selenium Concentration



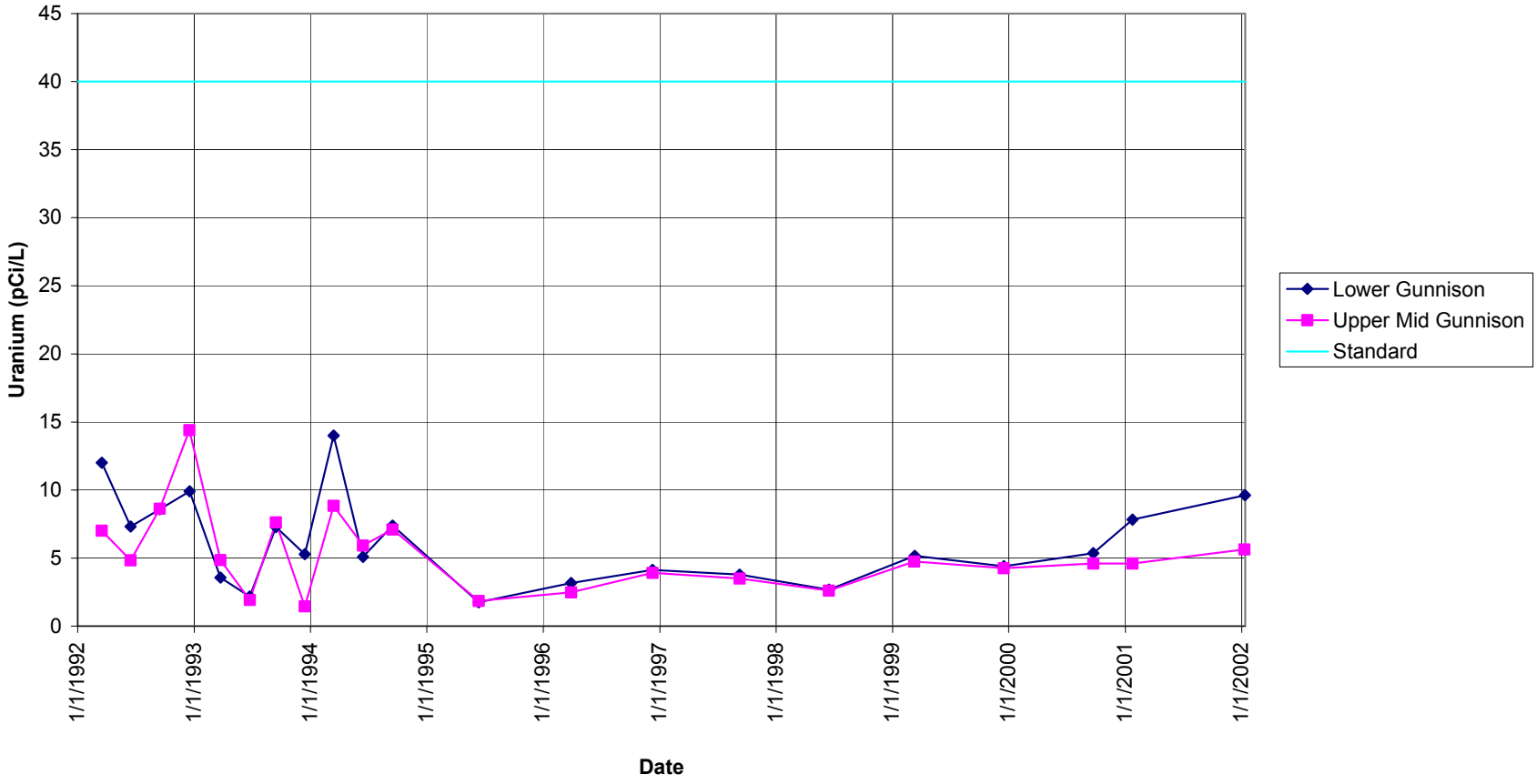
**GRAND JUNCTION OFFICE**

**Selenium Concentration**



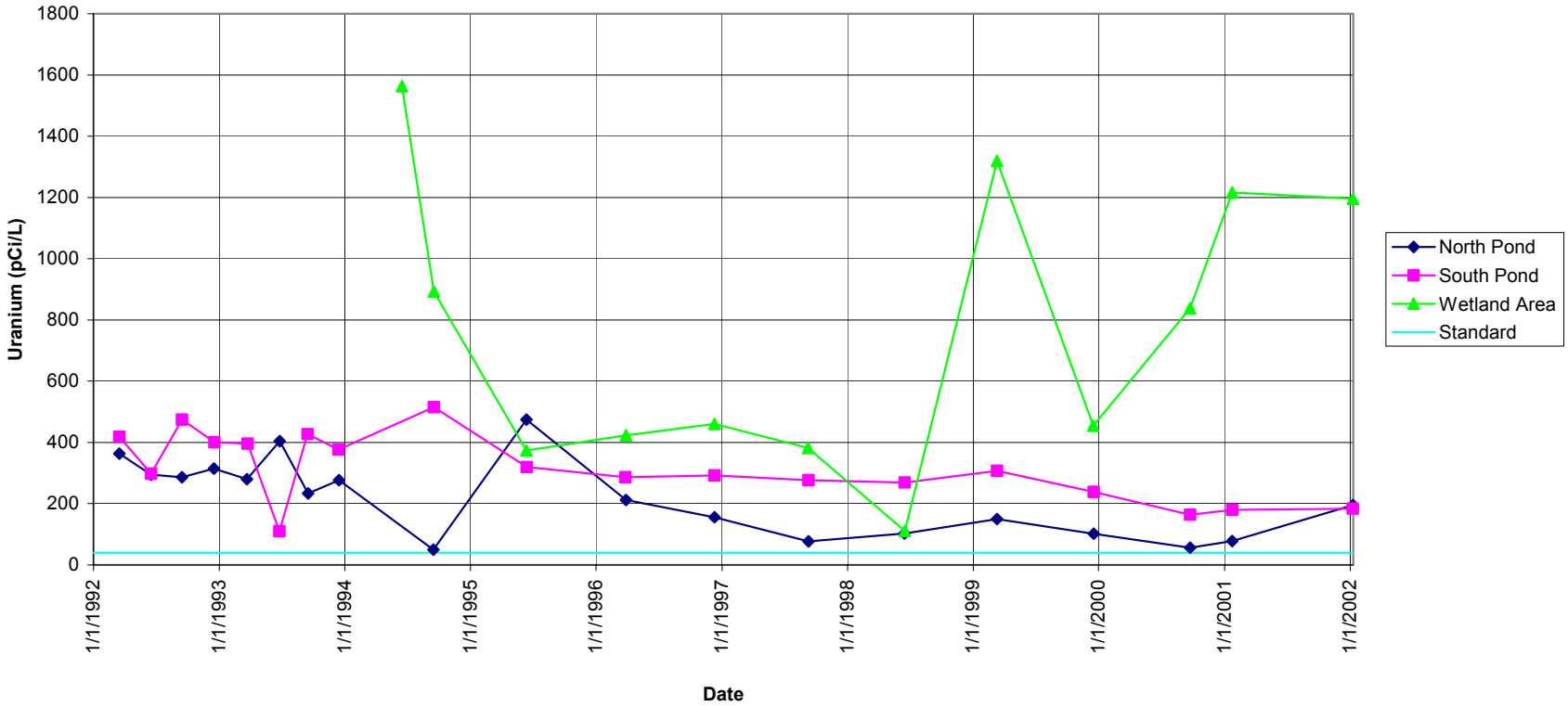
## GRAND JUNCTION OFFICE

### Uranium Concentration



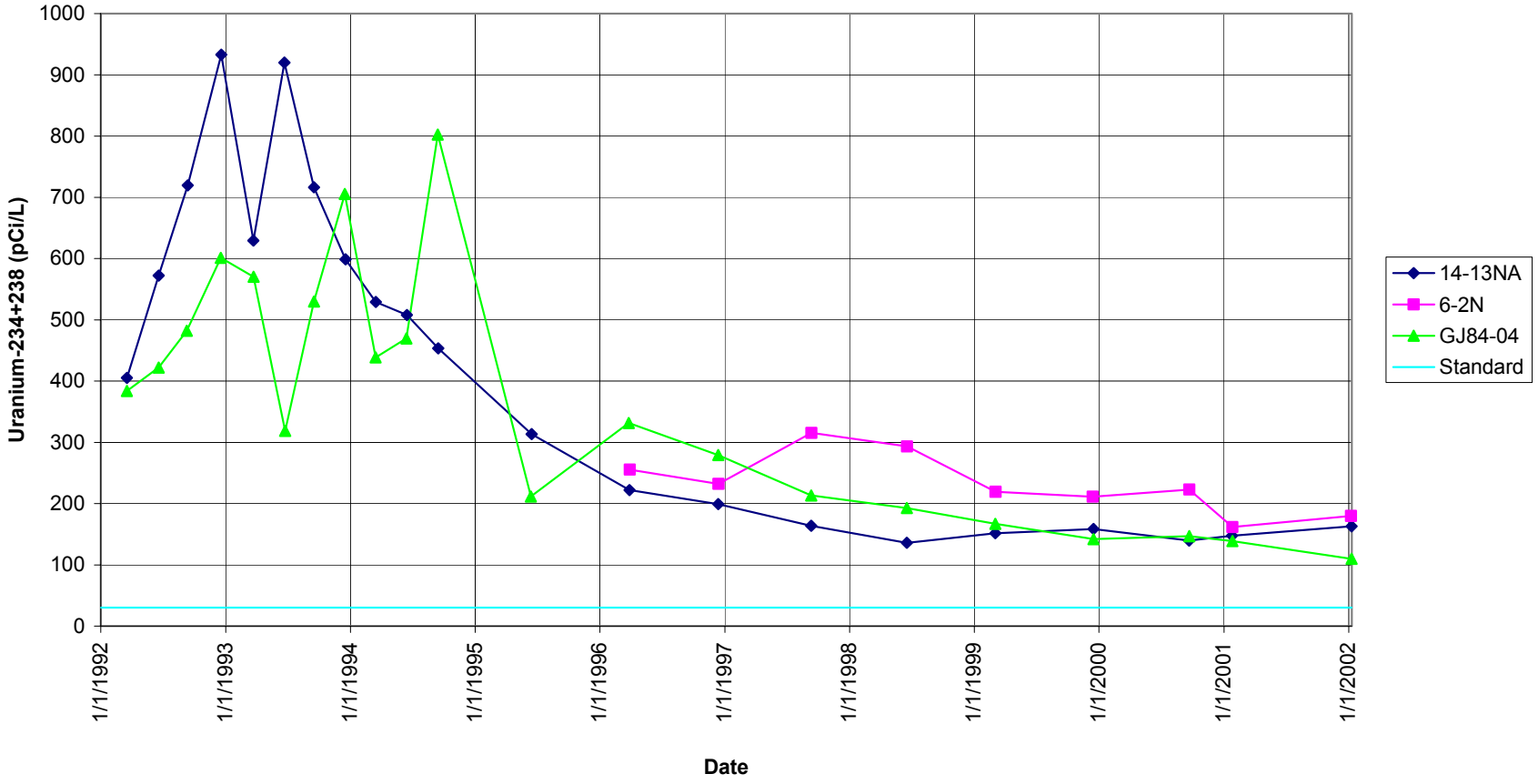
**GRAND JUNCTION OFFICE**

**Uranium Concentration**



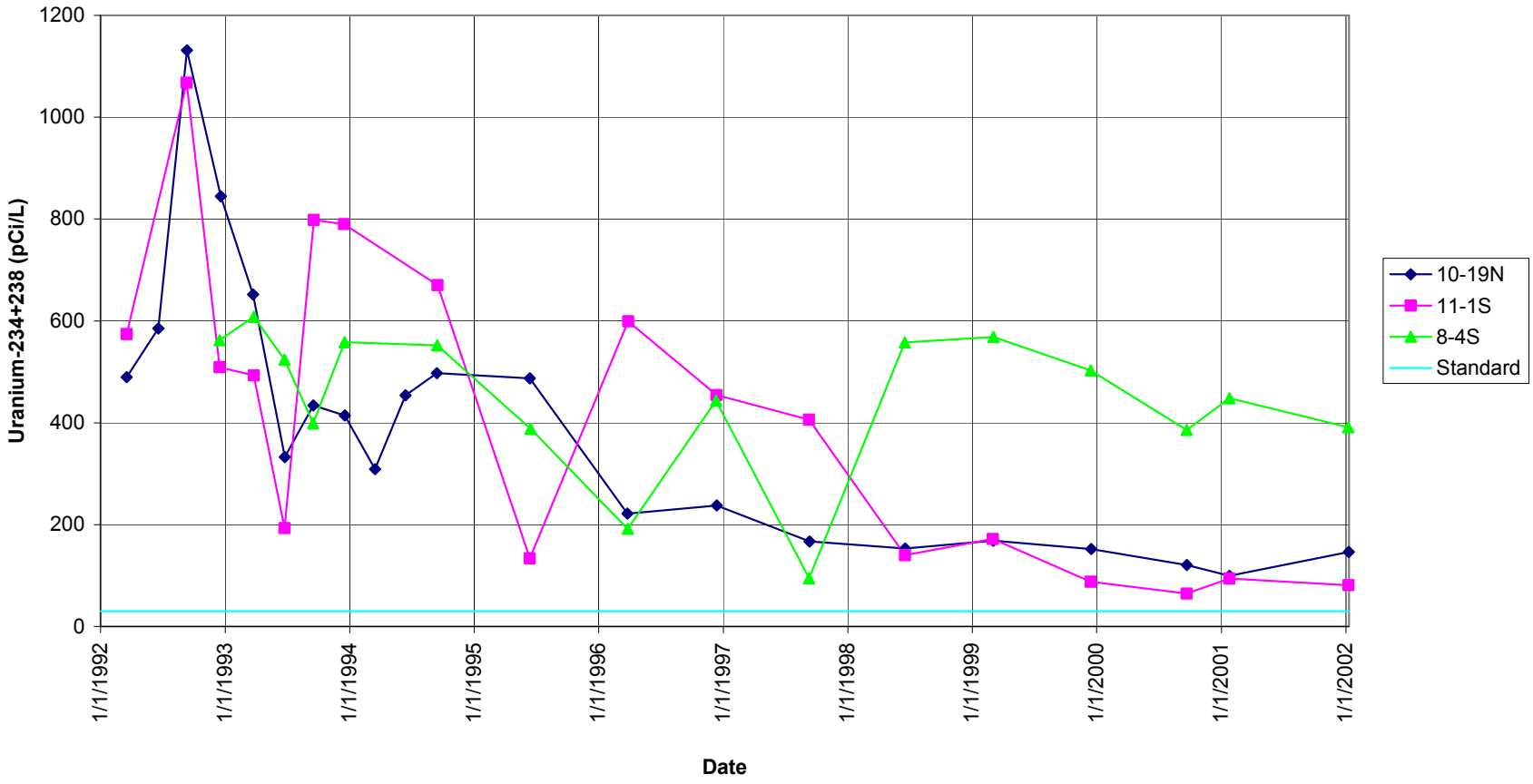
**GRAND JUNCTION OFFICE**

**Uranium-234+238 Concentration**



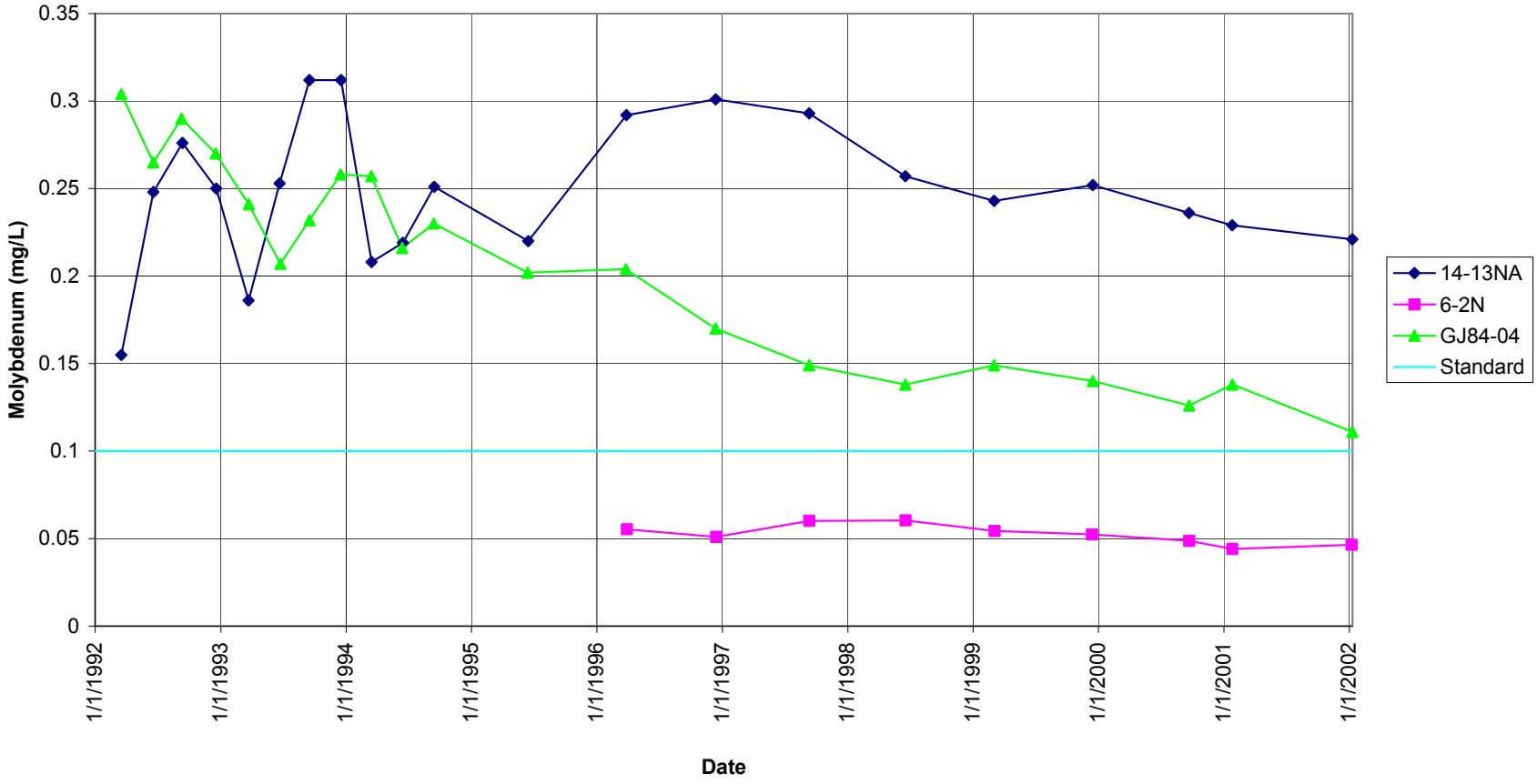
**GRAND JUNCTION OFFICE**

**Uranium-234+238 Concentration**



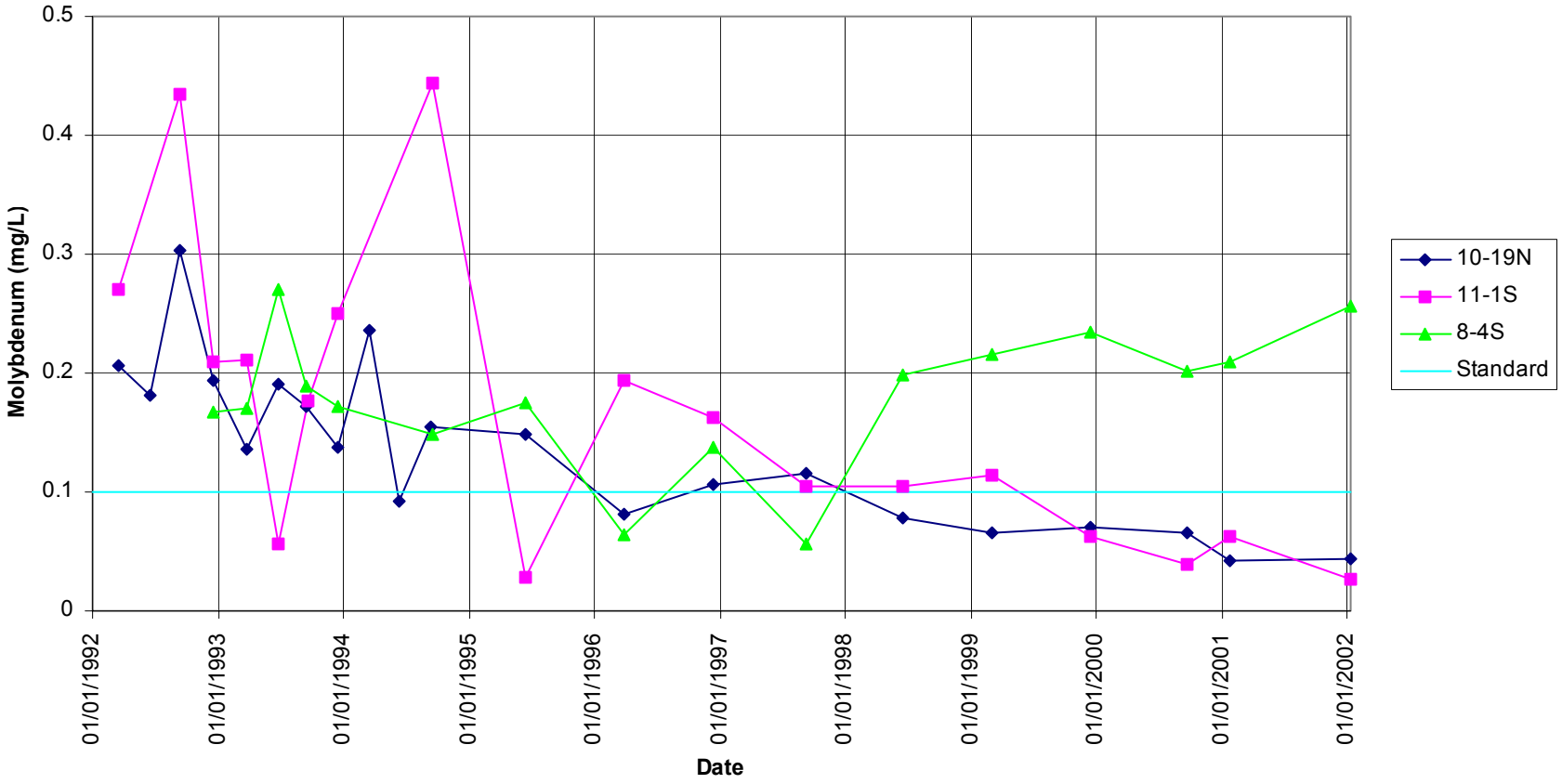
## GRAND JUNCTION OFFICE

### Molybdenum Concentration



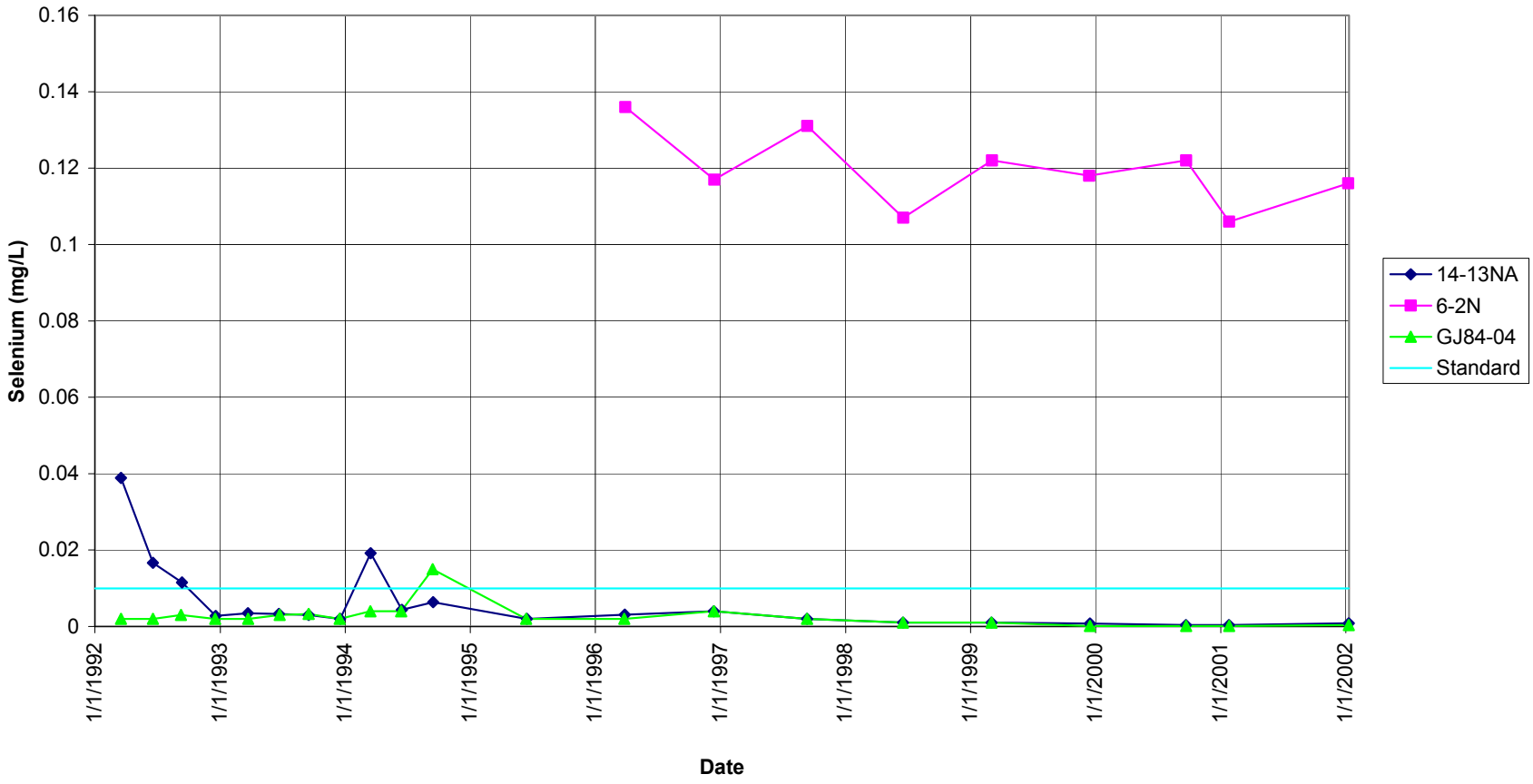
## GRAND JUNCTION OFFICE

### Molybdenum Concentration



## GRAND JUNCTION OFFICE

### Selenium Concentration



**GRAND JUNCTION OFFICE**

**Selenium Concentration**